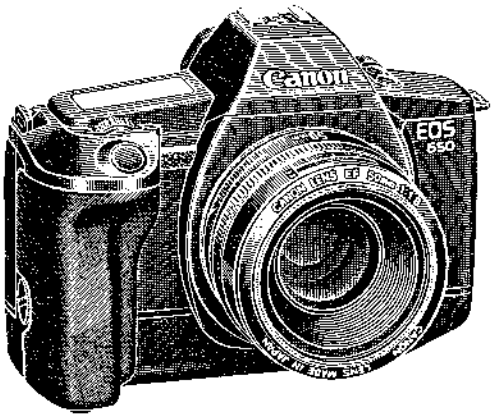
Canon

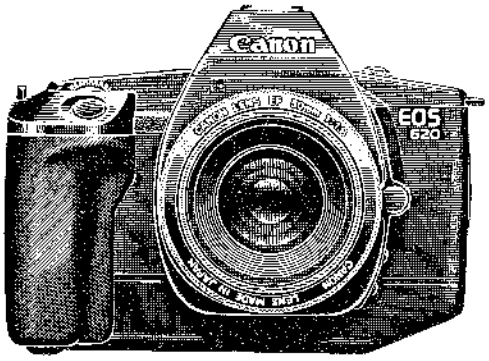
# Service Manual

ENGLISH EDITION

## EOS 650

## EOS 620




© CANON INC. 1987

CY8-2021-001-200

THIS VOLUME CONTAINS THE FOLLOWING THREE BOOKS.

1. ASSEMBLY, DISASSEMBLY AND MECHANICAL ADJUSTMENTS

2. ELECTRICAL ADJUSTMENTS
   (Including EOS TOOL Instruction Manual)

3. GENERAL INFORMATION
   (Specifications, Functional Descriptions,
   Electrical Explanations, Electrical Diagrams,
   and Notes Concerning Use)

# ASSEMBLY, DISASSEMBLY AND MECHANICAL ADJUSTMENTS

## CONTENTS


Introduction ..... i
Preparations for Repair ..... i
Color Code ..... ii

I External Parts Removal ..... I-1

II Front Panel Removal

1. Lead Wire Disconnection ..... II-1
2. Front Panel (Input Dial, LCD) ..... II-3

III Front Panel Assembly, Disassembly, & Adjustment

1. Shutter Unit & Main Flex Removal ..... III-1
2. Shutter Unit & Main Flex Installation ..... III-4
3. Mirror Unit ..... III-5
4. Mirror Angle (45°) Adjustment ..... III-9
5. Mirror Installation ..... III-11
6. AF Sensor Positioning ..... III-12
7. Rewind Mechanism Unit Disassembly ..... III-13

IV Winding Unit

1. Removal ..... IV-1
2. Perforation Adjustment ..... IV-2
3. DX Flex Unit Removal ..... IV-3
4. Winding Unit Disassembly ..... IV-4

V AL Cover, Contacts, and Minor Body Parts Removal .... V-1

VI Flange Focal Distance Adjustment ..... VI-1

VII Flange Focusing Screen Adjustment ..... VII-1

VIII Shutter Unit Disassembly ..... VIII-1

IX Top Cover Disassembly ..... IX-1

X Grip Unit Disassembly ..... X-1

XI Electronic Dial Disassembly ..... XI-1

XII Pentaprism Unit Disassembly ..... XII-1

XIII Lead Wire Dressing ..... XIII-1

XIV Shutter Unit Removal (Shortcut Method) ..... XIV-1

Addenda

Service Tools List & Expendables
Local Fabrication Tools Instructions
Early Production Supplementary Wiring Diagrams

Introduction

With the ever-increasing automation of cameras comes and ever-increasing level of circuit sophistication and encroachment of electronics into traditionally mechanical relms. Traditional mechanical skills must be supplemented with electronic knowledge and skills, and a complete rethink of after service is necessary.

The editing of service materials has been included in the rethink. We hope they have been improved to better meet the needs of today's service technicians. Here are some of the changes.The circuitry used contains extensive self-checking and correcting capabilities. Except for a few mechanical ones, adjustments can be made with the EOS TOOL, hereafter called the EOS Tool, after removing only the front cover. The table of contents should be helpful in understanding the repair flow.

Early Production Models

Two special circuits are used on early production units. They are known as the PUC circuit and the Back circuit. Wiring diagrams are included at the back of this guide.

Preparations for repair:

1. The operating current is higher than previous models, so the customers battery should not be used during repair. Use either a service battery, or the low voltage power supply and a dummy battery, which can be made from parts available from Camera Service Tools.

2. Use only recommend adhesives and lubricants, or ones that you know are safe for plastics. When using unsafe expendables, like Keton, use special care not to get them on any plastic parts.

3. When working with the top cover removed, use the LCD protection cover over the LCD.

4. With the EOS Tool, it is possible to read the number of rolls of film used and the number of prior servicings. This should be of value for service maintenance records. (The number of exposures per roll is not indicated.)

5. Only the shutter blades are available separately for the shutter unit. In other cases, replace the shutter unit. This is necesary to insure service quality control.

6. When IC4 is changed, the camera will not operate until the EOS Tool is used to "initialize" the chip. When the main flex is changed, IC4 is initalized to a standard value, but it is not adjusted. All IC4 adjustments must be performed whenever either the main flex or IC4 is replaced.

7. The camera will not operate when the battery is inserted until the grip screw is tightened, opening the reset switch.

8. The camera is built so that the shutter unit and main flex are integral with the front panel unit, so front panel removal will probably be more frequent than previously.

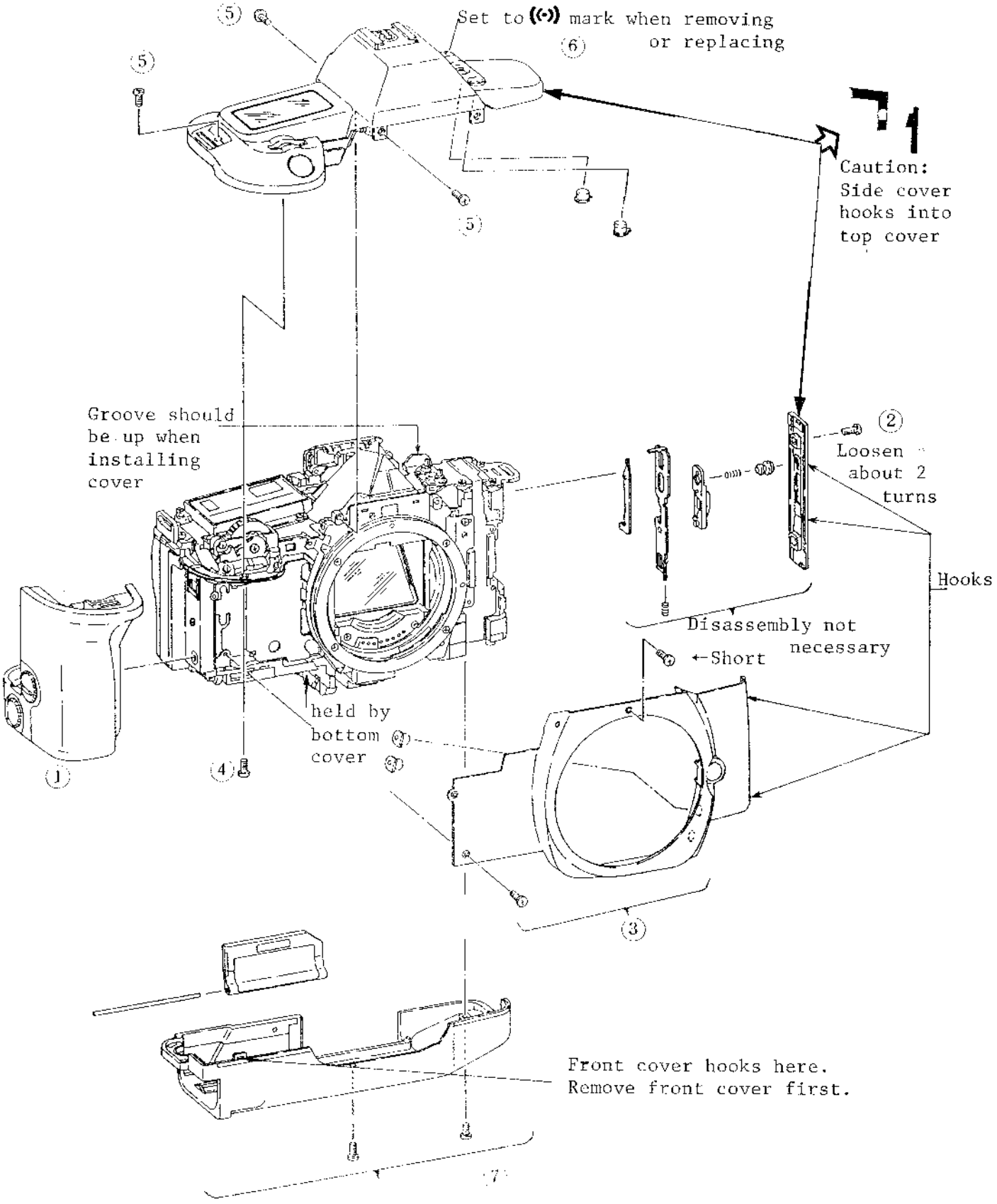
9. Most adjustments can be accomplished using the EOS Tool after removing only the front cover.

10. Color Code

To save space on drawings, it has been necessary to uses a color code. The code is:

| Color | Code | Color | Code | Color | Code |
|---|---|---|---|---|---|
| Black | BL | Blue | BU | Gold | GL |
| Brown | BR | Violet | V | Tan | T |
| Red | R | Purple | PR | Pink | PK |
| Orange | O | Gray | GY | Sky Blue | SB |
| Yellow | Y | White | W | Yellowish Green | YG |
| Gree | GN | Silver | S | | |

# I. External Parts Removal



# I. External Parts Removal

## DISASSEMBLY NOTES

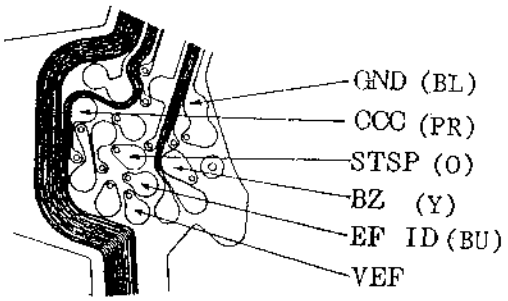
1. To remove the front cover, loosen the screws in the hook cover about two turns.

2. After loosening the screws and removing the grip, the front cover and then the top and bottom covers can be removed as necessary. When removing the top cover, always set the main switch to the beeper [ ((·)) ] mark. Pry the top of the hook cover out slightly and lift the cover off.

3. Always remove the front cover before removing the bottom cover.

Top Cover Wiring

| Function | Color | OD | L |
|---|---|---|---|
| GND | Black | 0.6 | 75 |
| CCC | Purple | 0.6 | 75 |
| STSP | Orange | 0.6 | 75 |
| BZ | Yellow | 0.6 | 75 |
| EFID | Green | 0.6 | 75 |
| AVEF | Blue | 0.6 | 75 |




## ASSEMBLY NOTES

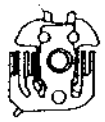
1. When installing the top cover, make sure the main switch is set to the beeper [ ] mark and set the main switch so the knob slot is facing upward.

2. Take care not to pinch any lead wires between the body and top cover.

3. Check the main switch operation after installing the top cover.

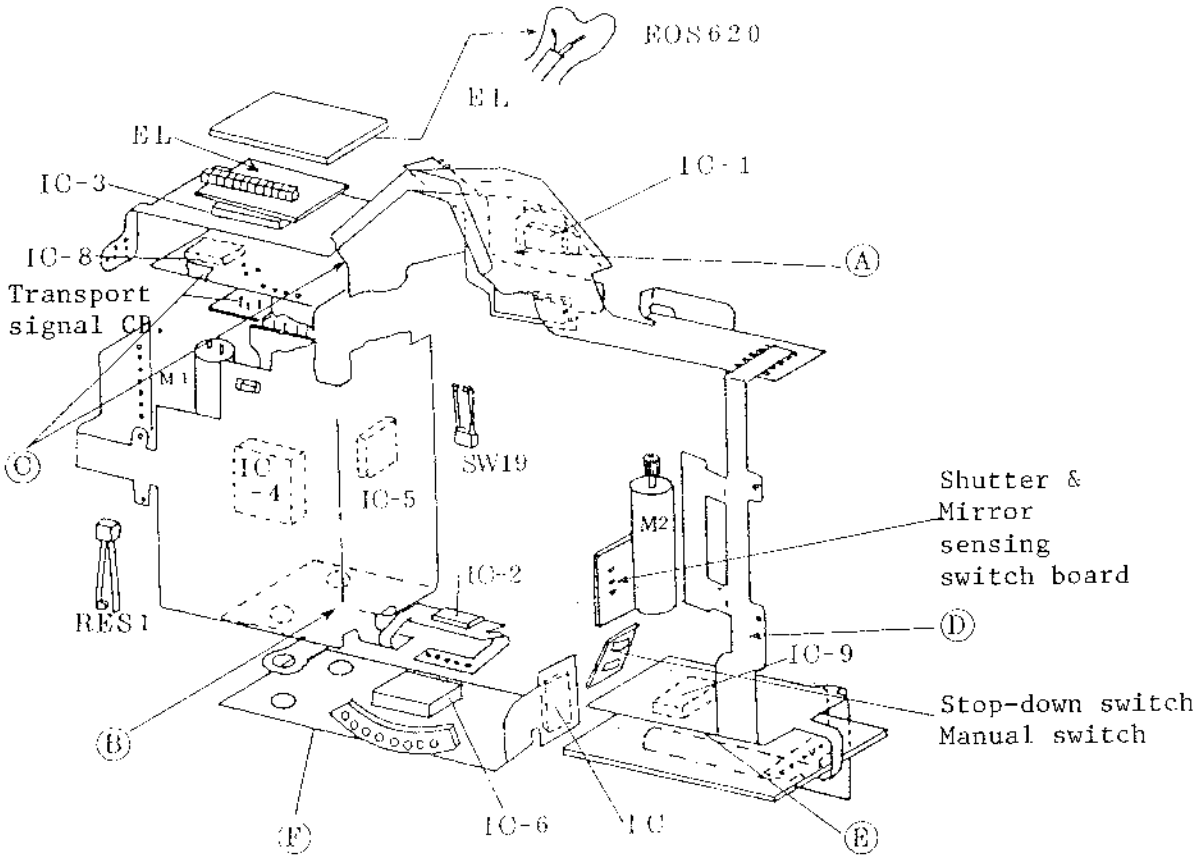
4. Use the correct screw in the front cover at the top of the lens mount. It is shorter than the other screws.

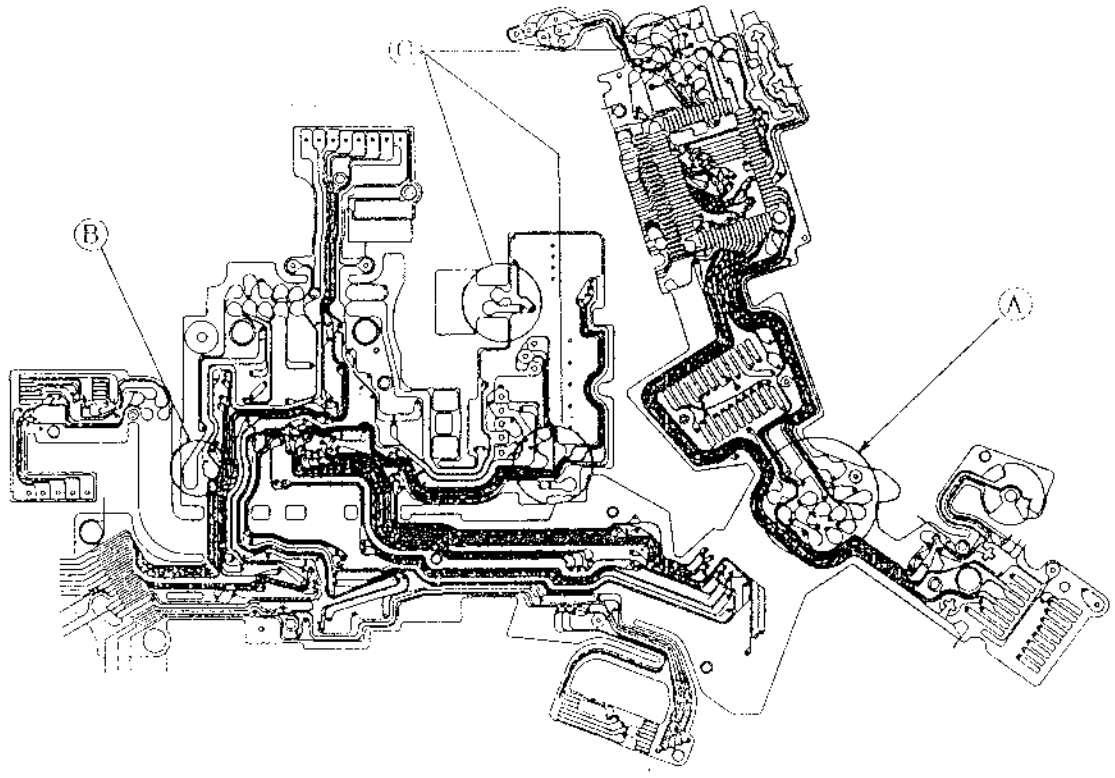
Main Switch



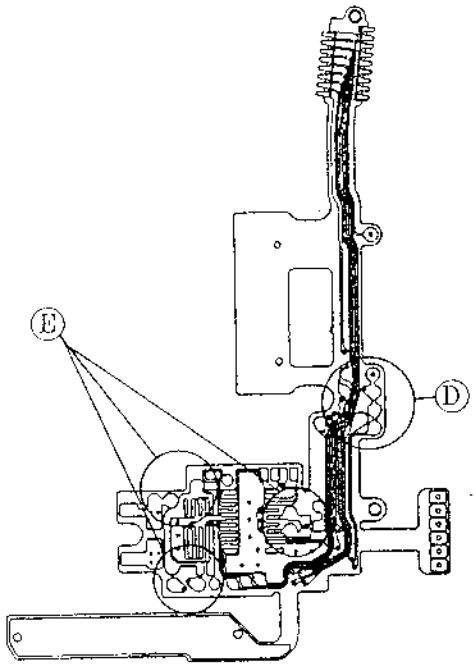
# II Front Panel Removal

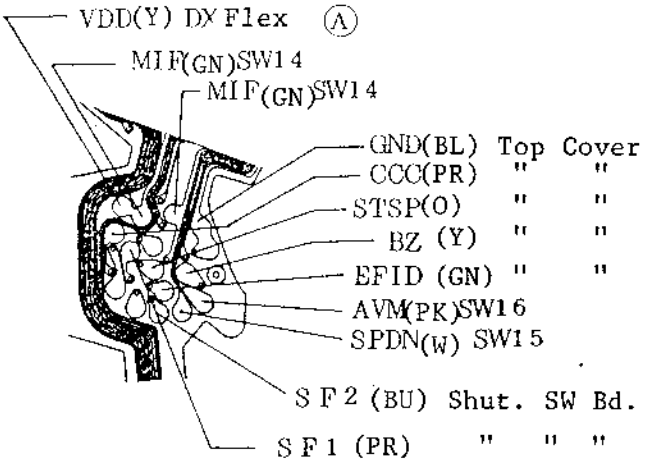
## 1. Lead Wire Disconnection

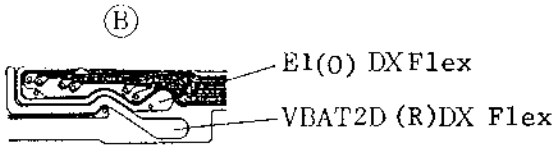


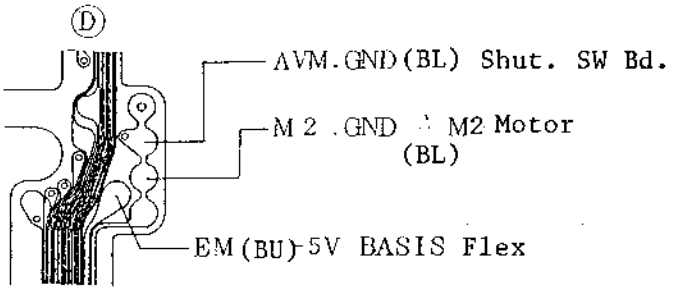



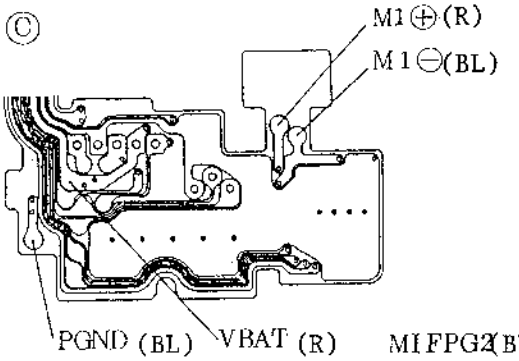
1. Lead Wire Disconnection

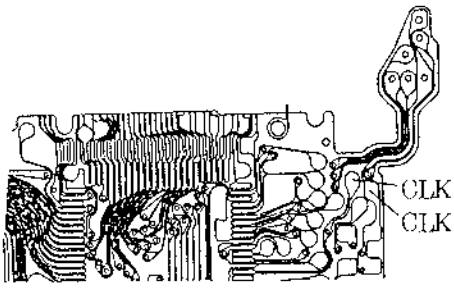


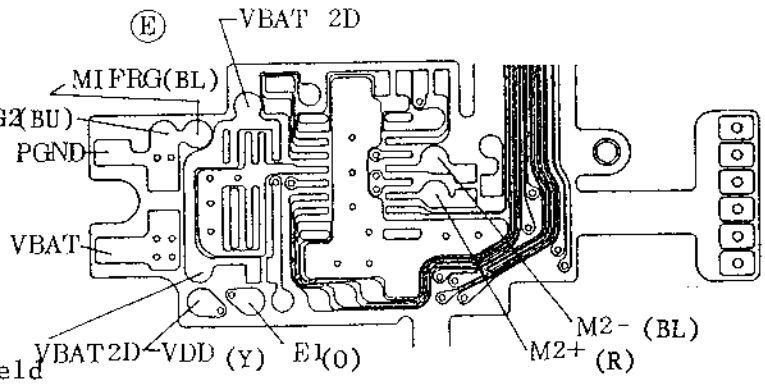



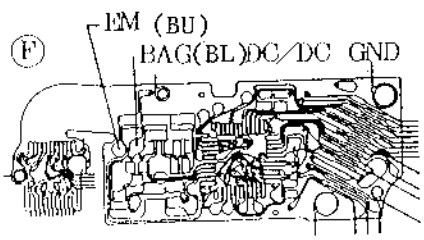



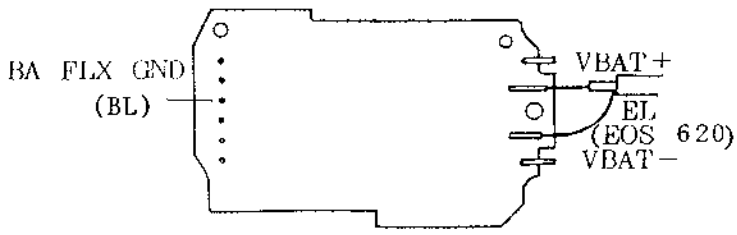



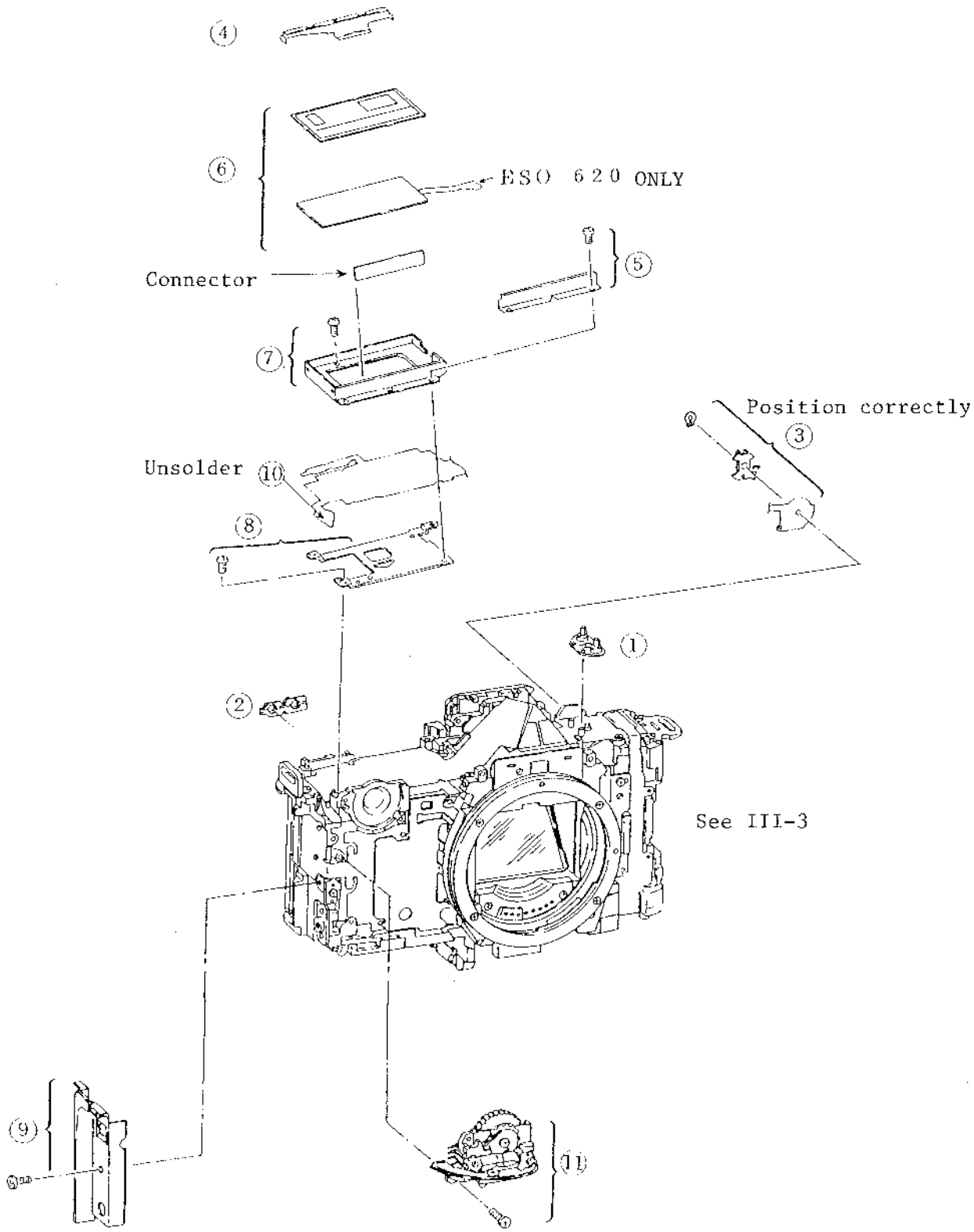



## 2. Front Panel (Input Dial, LCD)



2. Front Panel (Input Dial, LCD)

## DISASSEMBLY NOTES

1. To disassemble the LCD, unfasten the hooks on both edges of LCD holder (4), and disassemble in numerical order.

2. Handle the connector with tweezers only and clean with Fronsolve AE before reinstalling.

## ASSEMBLY NOTES

1. Install the guide pins in LCD case (3) in the holes (A) in main flex before fixing the unit.

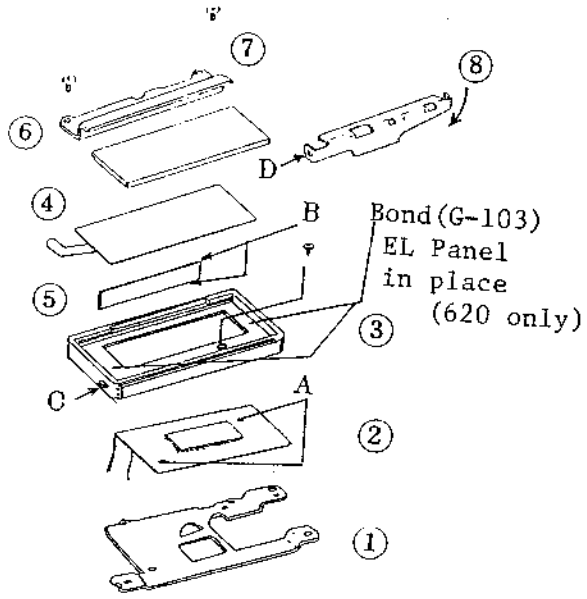
2. Clean the edges (B) of elastic connector (5) with Fronsolve immediately before reinstalling.

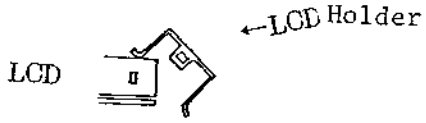
3. Couple the LCD holder (8) (D) with the pin (C) on LCD case (3) and rotate in the arrow direction.

4. Place the opening of the G ring about 120° to 130° of vertical to prevent interference with the part of the switch marked "A".

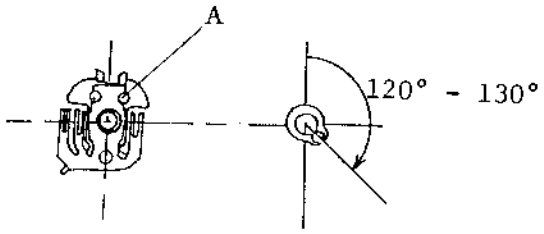
5. Clean the mode switch (1) and AE lock switch (2) with Fronsolve. (Number indicate facing page.)

6. Do not touch the electronic dial contacts.



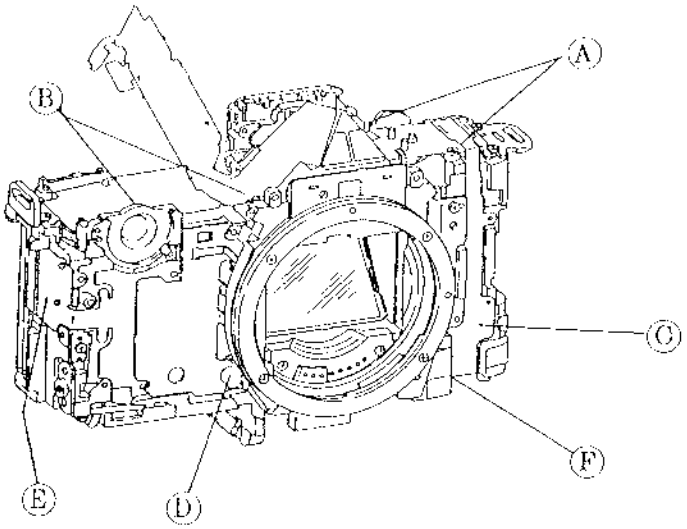



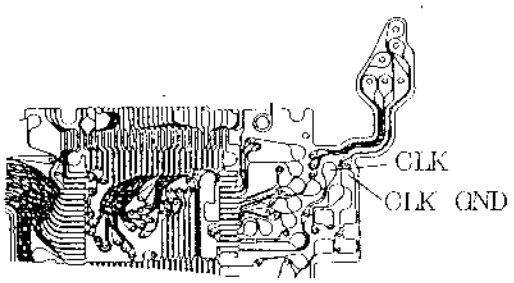

LCD base

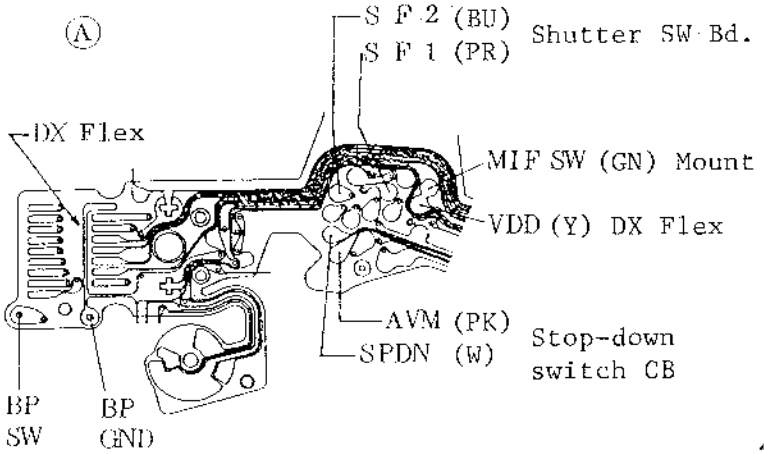


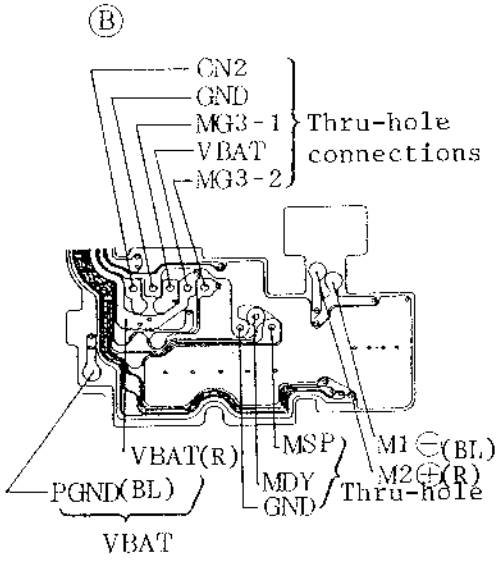
# III Front Panel Assembly, Disassembly, & Adjustment

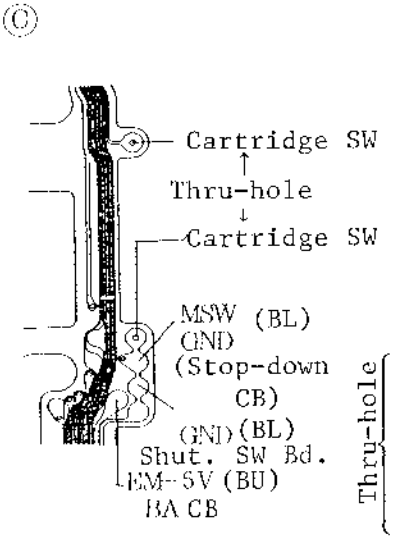
## 1. Shutter Unit & Main Flex Removal

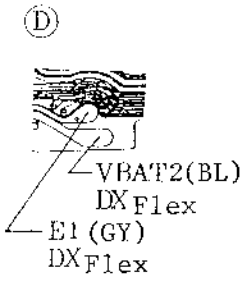


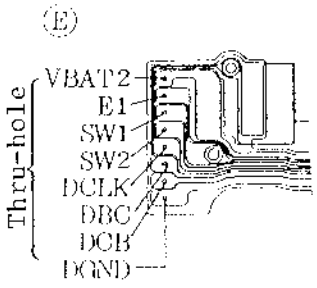



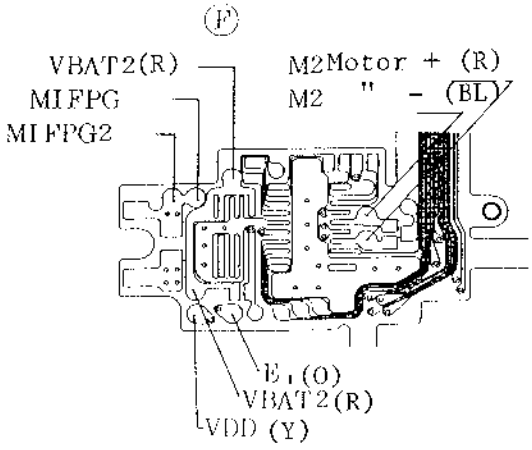



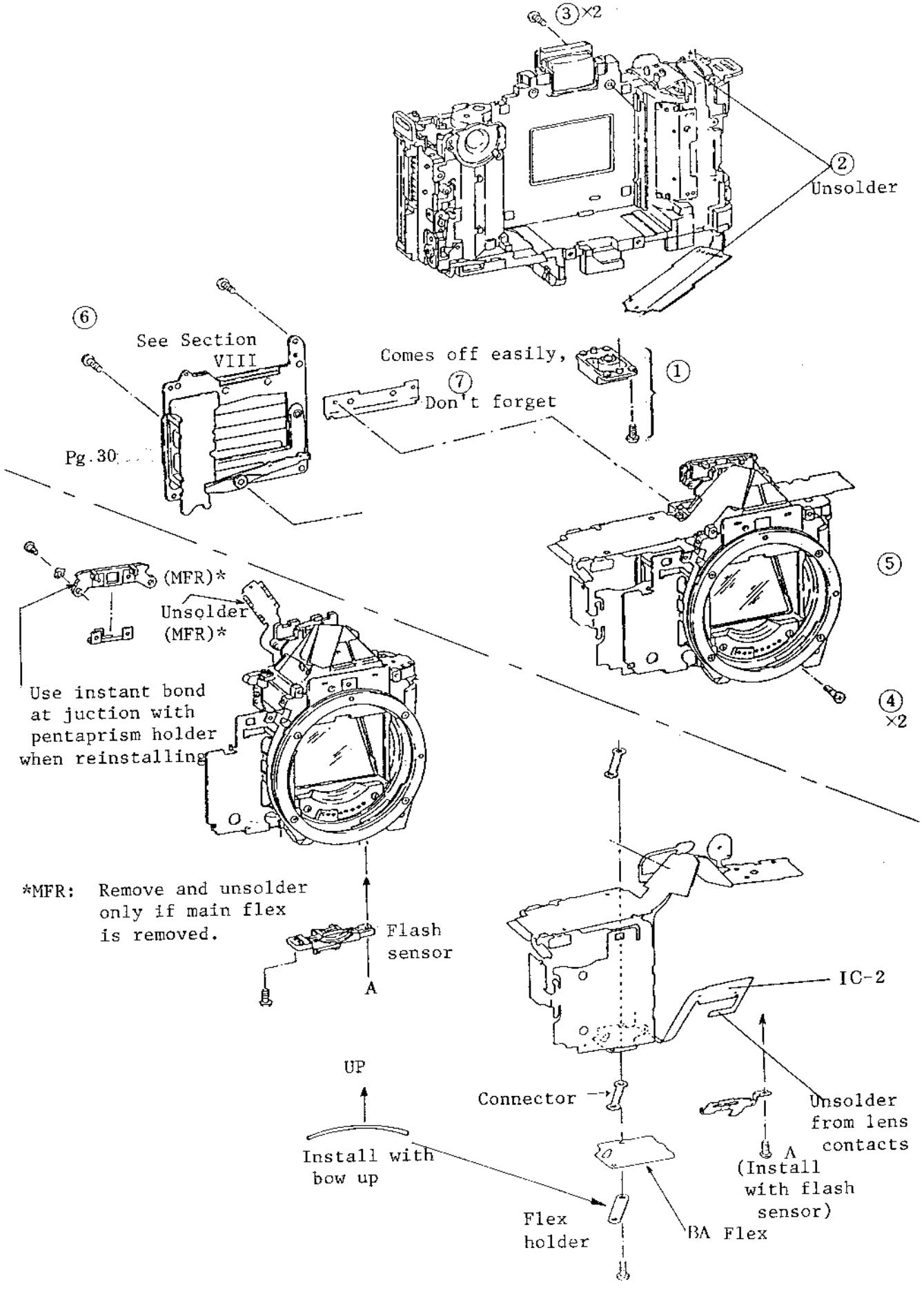



## 1. Shutter Unit & Main Flex Removal



1. Shutter Unit & Main Flex Removal

## ASSEMBLY & DISASSEMBLY NOTES

1. Unsolder leads as shown on page III-1.

   If the main flex is to be removed from the viewfinder LCD, unsolder the connector and remove the SPC holder.

2. Remove the shutter unit in the charged position. The lower mounting screw cannot be removed unless the shutter is charged.

3. Don't touch the main to BA flex connector.

4. The main flex is attached to the front panel assembly at the rear of the front panel, the mirror hinge plate and the pentaprism holder. Be careful not to tear the flex at any of these attachment points when removing it.

III Front Panel Assembly, Disassembly, & Adjustment

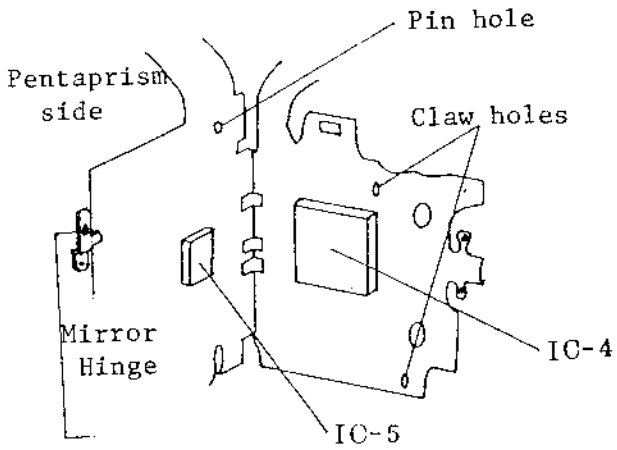
2. Shutter Unit & Main Flex Installation

## ASSEMBLY & DISASSEMBLY NOTES

1. Fold the main flex between IC-4 and IC-5. Push the edge under the mirror hinge and set it on the pin on the side of the mirror box and the two claws on the back of the front panel.

   IC2 and the sensor holder (pg. III-2) are installed with the sensor case.

   The main flex folds double over the pentaprism and is placed on the pin on the prism holder.

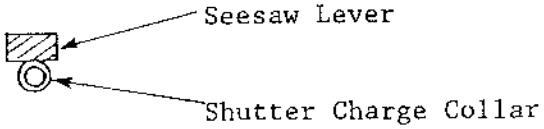



2. Clean the connector between the main and BA flex with Fronsolve AE just before connecting. Handle the elastic connector only with tweezers.

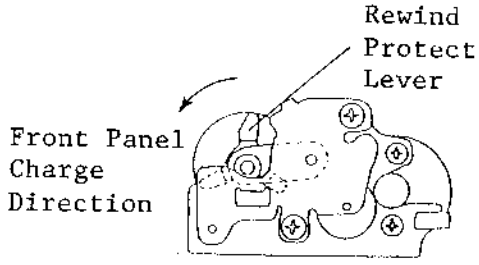
   The flex holder is bowed. Install with the convex side against the flex.

3. Install the shutter unit after installing the main flex. Install the unit with the shutter charged and the mirror in the raised position.

   The see-saw lever should be above the shutter charge collar, as shown.

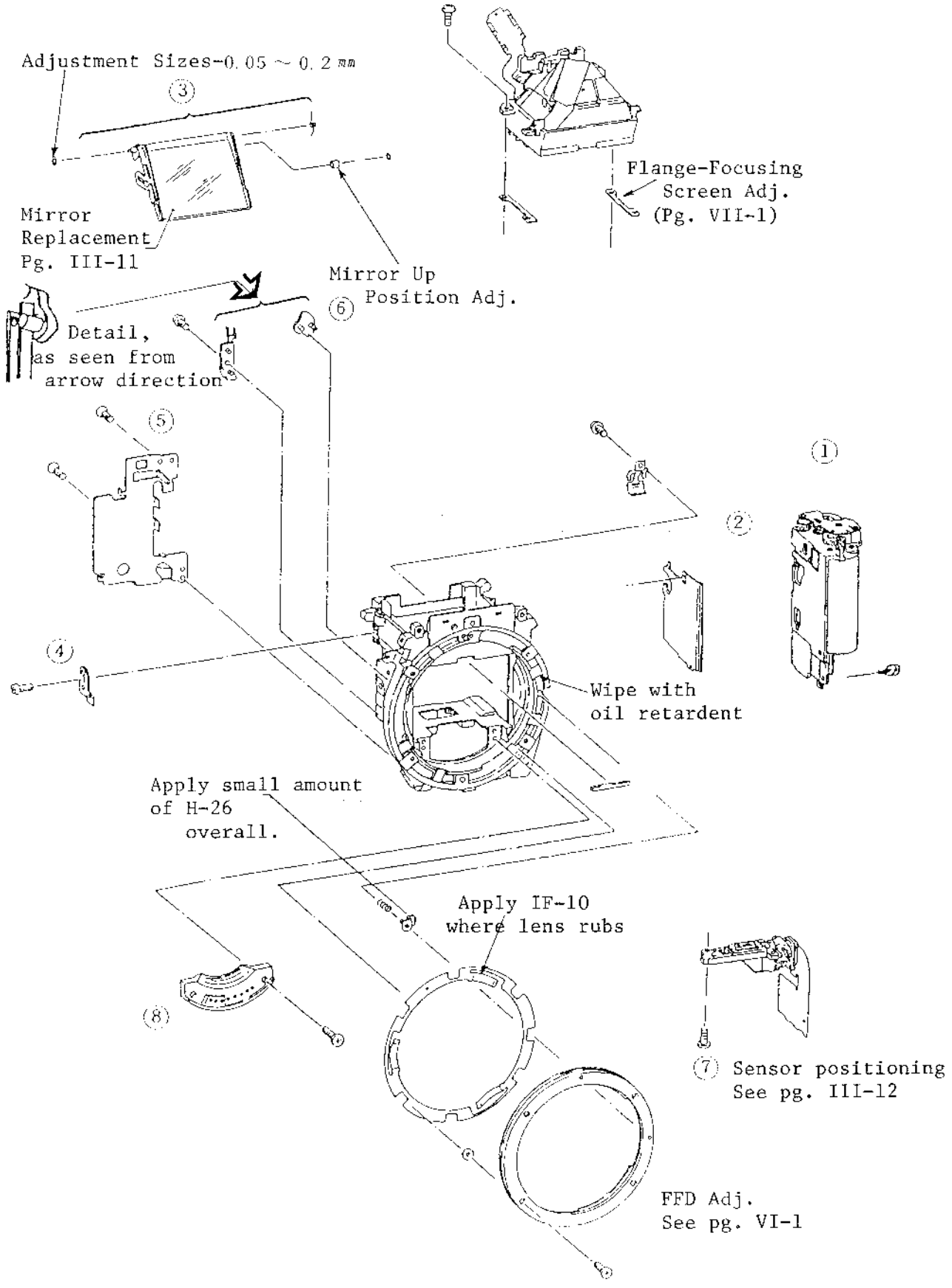



4. When installing the front panel unit is installed into the body, the protect lever should be toward the front panel charge direction, as shown.



III Front Panel Assembly, Disassembly, & Adjustment

3. Mirror Unit



3. Mirror Unit

## ASSEMBLY & DISASSEMBLY NOTES

1. If the rewind mechanism (1) is removed, check the main and sub mirror angles.

2. Don't touch the contacts when the contact assembly (8) is removed. Use a reasonably high wattage iron to unsolder the contacts so the time can be kept to a minimum. (The contact base is plastic.)

3. To remove the mirror, remove the rewind mechanism (1) instead of removing the mirror hinge (4). The mechanism position is used top adjust the mirrors. If the hinge is removed, the mirror angle adjustment is more difficult and time consuming.

4. Mirror Installation (if the hinge has been removed)

4.1 If the hinge (4) is removed, install the hinge with the guide pin in the center of the slot and temporarily tighten the screws.

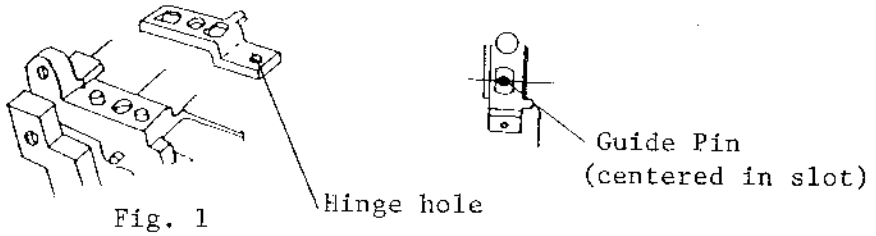



Fig. 1

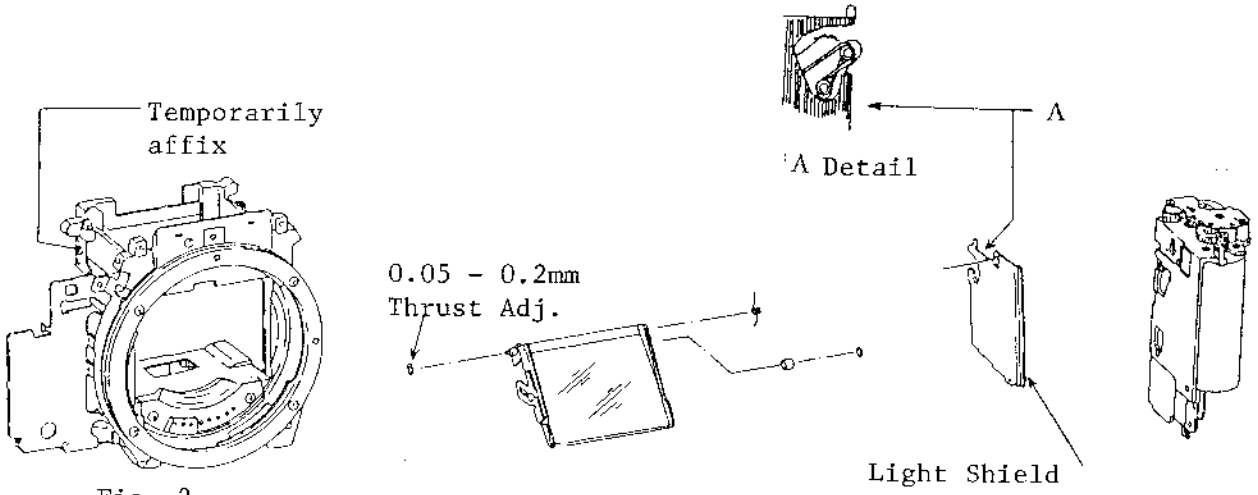



Fig. 2

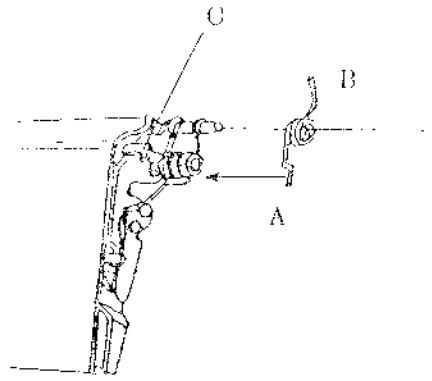
3. Mirror Unit

ASSEMBLY & DISASSEMBLY NOTES

4.2 Install the spring on the hinge and hook the "A" end in the V groove and temporarily hook the "B" end at "C",

(Ref: fig. 4). Slide the sub mirror open as shown and install the hinge in its pivot (1). Connect (2) with the eccentric. Install the mirror, making sure all pins on both the main and sub mirrors are in the correct positions. Install the light shield on the guide pins and then install the rewind mechanism. Make sure the mirror hinge is in the pivot hole in the rewind mechanism.

Make sure the light shield has not been damaged or pulled out of position.



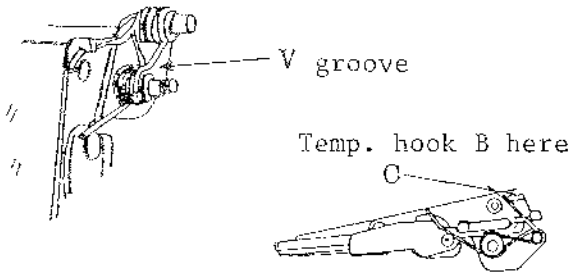




Fig. 3

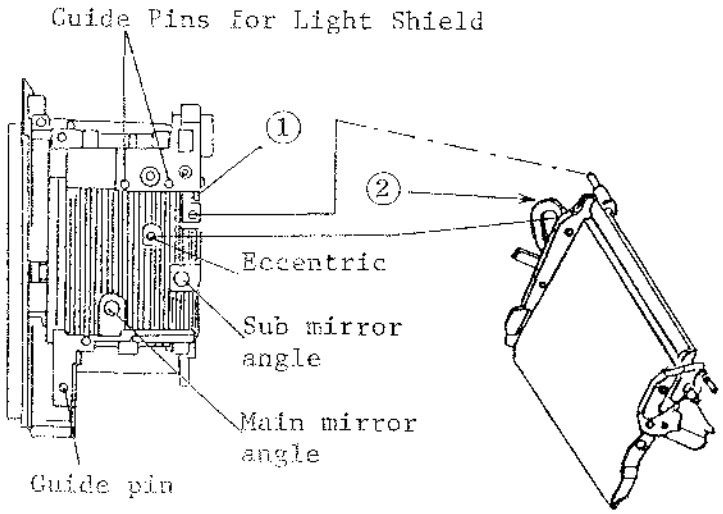



Fig. 4

3. Mirror Unit

## ADJUSTMENTS

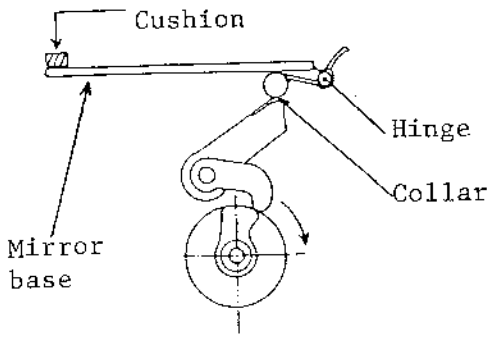
4.3 Use washers to adjust the thrust play of the mirror to 0.05 to 0.2mm (Fig. 2).

4.4 Rehook the "B" end (4.2) on the mirror box.

4.5 Invert the mirror box and lift the mirror to check that it hooks properly in the mirror down position. Hook strength: 3 to 10 grams. If weak, change the spring.

4.6 Turn the planetary gear on the rewind mechanism unit to raise the mirror. Adjust so there is no space between the mirror and the cushion by changing the collar.

Std: 14.9mm +0.4, -0.2mm from axis to mirror base.




After adjustment connect M2 to a 2 to 3 volt power supply (with plus and minus reversed) and check for proper mirror operation.

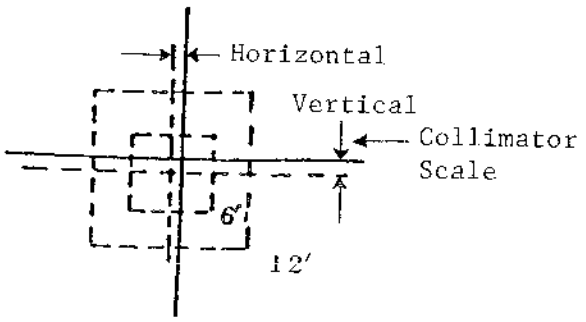
III Front Panel Assembly, Disassembly, & Adjustment

4. Mirror Adjustments(45°)

## ADJUSTMENTS

1. Standard:

| | | |
|---|---|---|
| Main Mirror: | Horizontal: | 45° ± 8' |
| | Vertical : | 45° ± 3' |
| Sub Mirror : | Horizontal: | 45° ± 10' |
| | Vertical : | 45° ± 5' |




2. Tools:

2.1 90° Collimator

2.2 EF Mount Adaptor

2.3 Allen (hex key) wrench

Install Ⓐ,Ⓑ,Ⓒ when using the simplified 90° collimator.

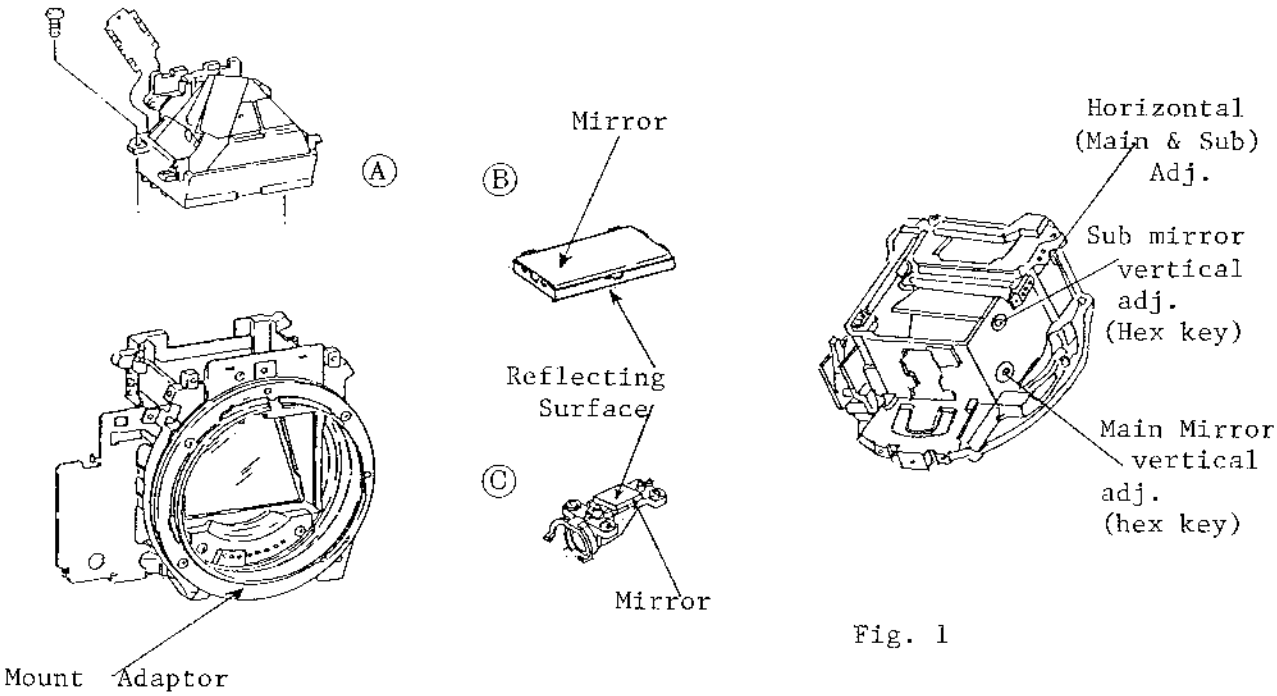



Fig. 1

4. Mirror Adjustments (45°)

## ADJUSTMENTS

3. Horizontal Adjustment

Remove the AF sensor unit.

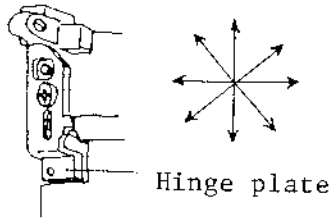
Since the sub mirror rides piggy-back on the main mirror, the two adjustments are interdependent.

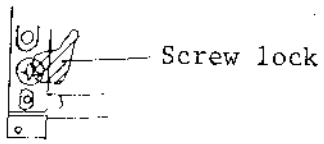
3.1 Method

Move the hinge plates as shown. Repeat until both main and sub mirrors are within tolerances.

When correct, tighten the screw and stake the screw and hinge plate with screw lock.

Fig. 2




4. Vertical Adjustment

Adjust the main and sub mirror using the hex sockets eccentrics on the side of the mirror box. (The adjustment order is not important.)

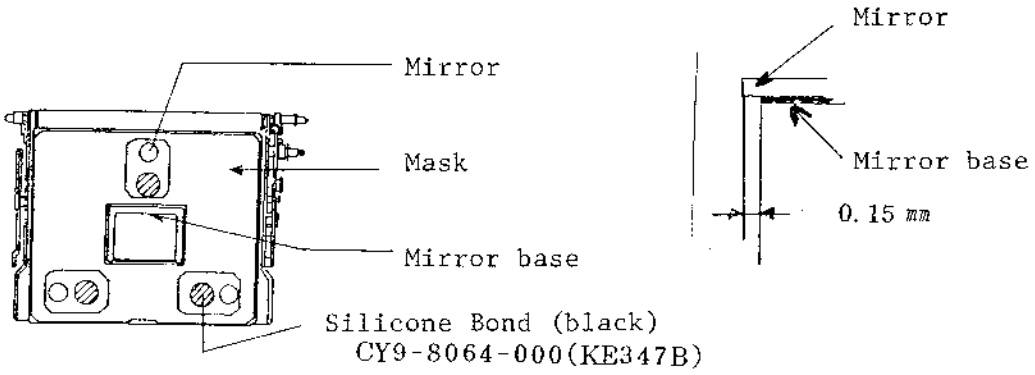
III Front Panel Assembly, Disassembly, & Adjustment

5. Mirror Installation

ASSEMBLY NOTES

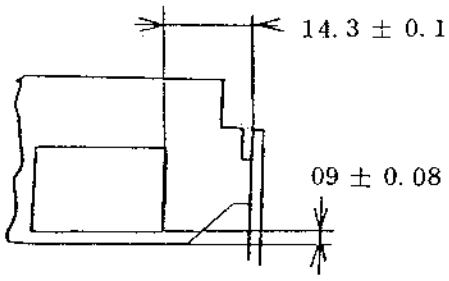
The mirror unit should be replaced whenever either of the mirrors must be replaced. The mirror base is usually deformed when a cracked mirror is removed. These procedures are included mainly for reference.

1. Main Mirror Positioning




2. Sub Mirror Positioning

The sub mirror is stocked only as a part of the main mirror unit. It is attached with double faced tape.



III Front Panel Assembly, Disassembly, & Adjustment

6. AF Sensor Positioning(After Mirror Angle Adjustment)

## ADJUSTMENTS

This adjustment aligns the center of the AF sensor with the optical axis. It is basic to the proper operation of the AF system.

1. Standard:

2.Tool: EF 50mm f/1.8 lens stopped down to about f/5.6 - f/8, and set to infinity to see the focus mark.

(To stop down the diaphragm, put the lens on an operational camera. With the camera in the manual mode set the aperture with the electronic input dial. Push the manual aperture set button and remove the lens while holding the button in.

3. Adjustment:

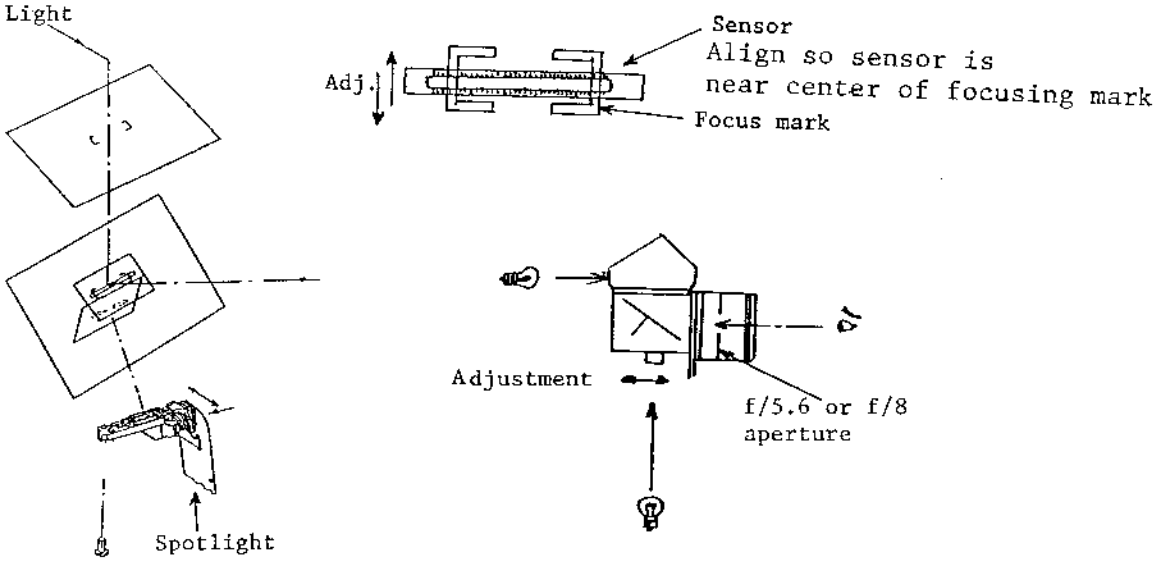
3.1 Install the AF sensor unit in the front panel unit with the pentaprism and focusing screen installed.

3.2 Install the stopped-down EF50mm lens.

3.3 Shine a light through the eyepiece. Next, shine a small, powerful, spot of light through the bottom of the AF sensor unit. Now, looking into the lens the outline of the sensor should be superimposed on the focus mark as shown above. Adjust the fore and aft (vertical in the finder) position so the sensor is centered in the focus mark.

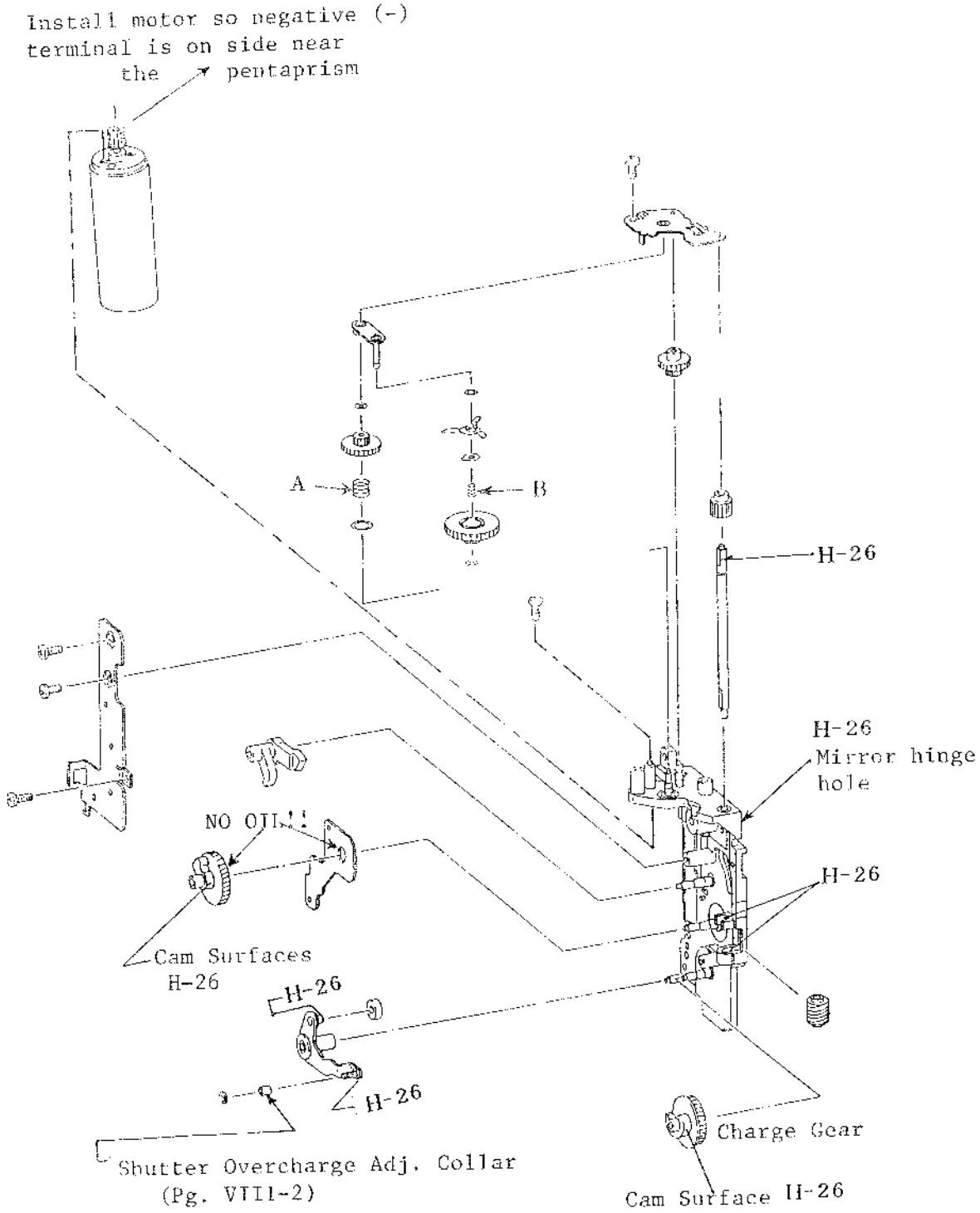
The horizontal adjustment is electrical, not mechanical.

3.4 After adjustment, tighten the screws just enough to hold the position and stake with screw-lock. (Over-tightening may break the sensor base.)



III Front Panel Assembly, Disassembly, & Adjustment

7. Rewind Mechanism Unit Disassembly




LUBE: Lubricate gear and lever shafts with H-26.

Exception: Do not lubricate the mirror gear shaft. Very lightly lube the gear hole, taking care to not get oil on the electrical contacts.

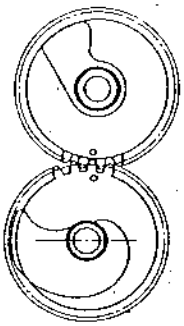
7. Rewind Mechanism Unit Disassembly

## ASSEMBLY NOTES

This unit is one of the few differences between the 650 and 620. Because of its 1/4000 shutter speed, the 620 uses a coreless motor and stronger gears. Be sure to use the correct parts for the model.

No-load Current Consumption (Unit only): EOS650 --- 170mA
EOS620 --- 110mA

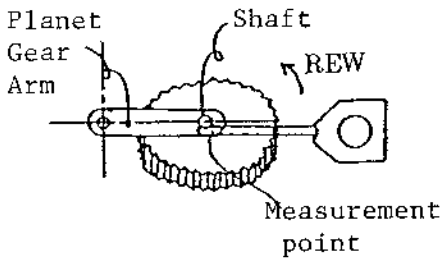
1. Install the mirror gear and charge gear as shown. Wipe the contact board with Fronsolve AE . Do not touch or soil the micro brush on the mirror gear.



2. Rewind Planetary Gear Torque

Spring "A" is a play arrester. If there is no play, then only "B" need be adjusted.

With a 10g dial tension gage. Check with the shutter unit removed from the front panel. Apply 3V to M2. Push on the arm with the gage and gradually release the pressure to find the changeover point of the planetary gear.



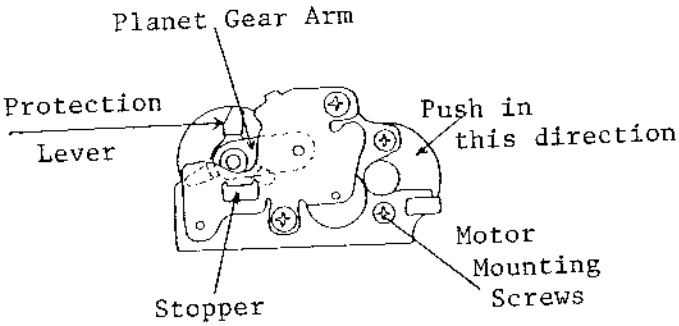

Standard: 5 to 8 grams

Low Torque: Will not rewind.

High torque: Some increase of wear and operation current

3. M2 Installation

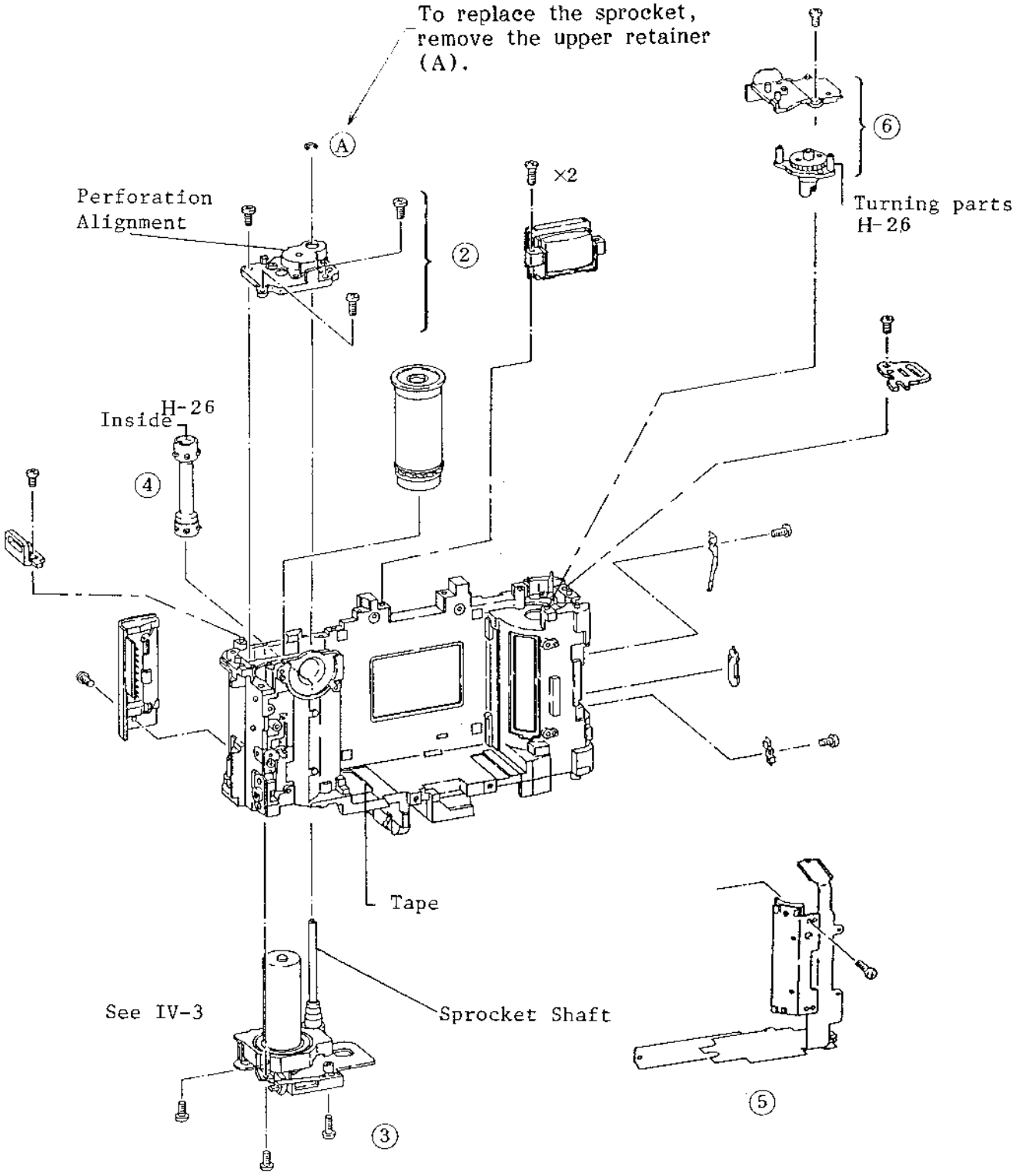
Press the motor in the arrow-marked direction and tighten the screws. The purpose of the protection lever is to prevent accidental reversal of the lever during operation. For example, if the gear is in the rewind position during film loading the film will be hard to pull out once the fork has engaged the film cartridge spool.




To remove the motor, insert the screwdriver from the pentaprism side and work the motor down as the screws are loosened.

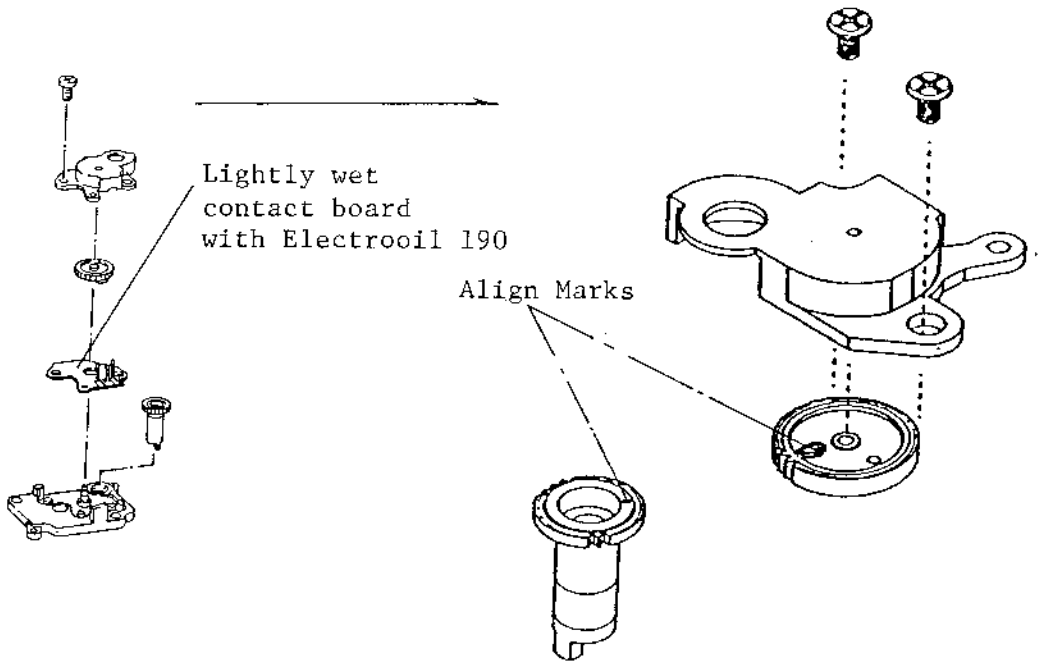
# IV Winding Unit

## 1. Removal



2. Perforation Adjustment

The perforation alignment is determined by the mesh of the gears on the winding signal circuit board.

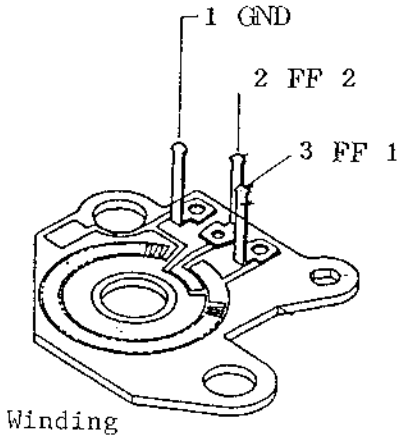



The movement of the sprocket causes a signal to be sent to IC-4, which controls the motor, determines framing and sends the print signal to the Technical Back.

Clean the board before reinstalling it.

Film Bar Signal FF1

Power Off Signal FF2




Winding
Signal Circuit Board

IV Winding Unit

3. DX Flex Unit Removal

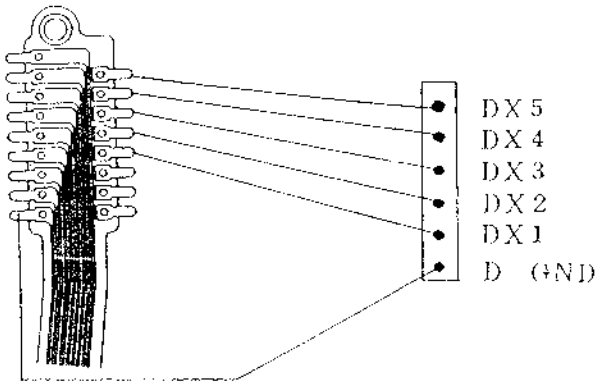
## ASSEMBLY & DISASSEMBLY NOTES

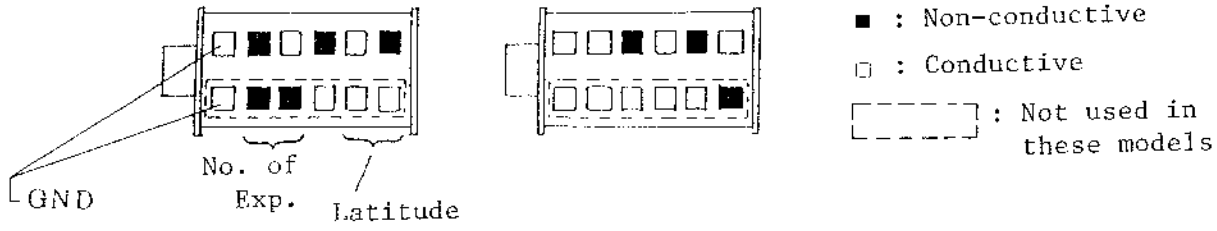
1. Check ISO 100 and 1000 by inserting the appropriate film cartridge.

   (Check before starting repair, also).

2. The unit can be checked independently with an ohmmeter.

   The EOS 650 and 620 only utilize the ISO portion of the DX code.

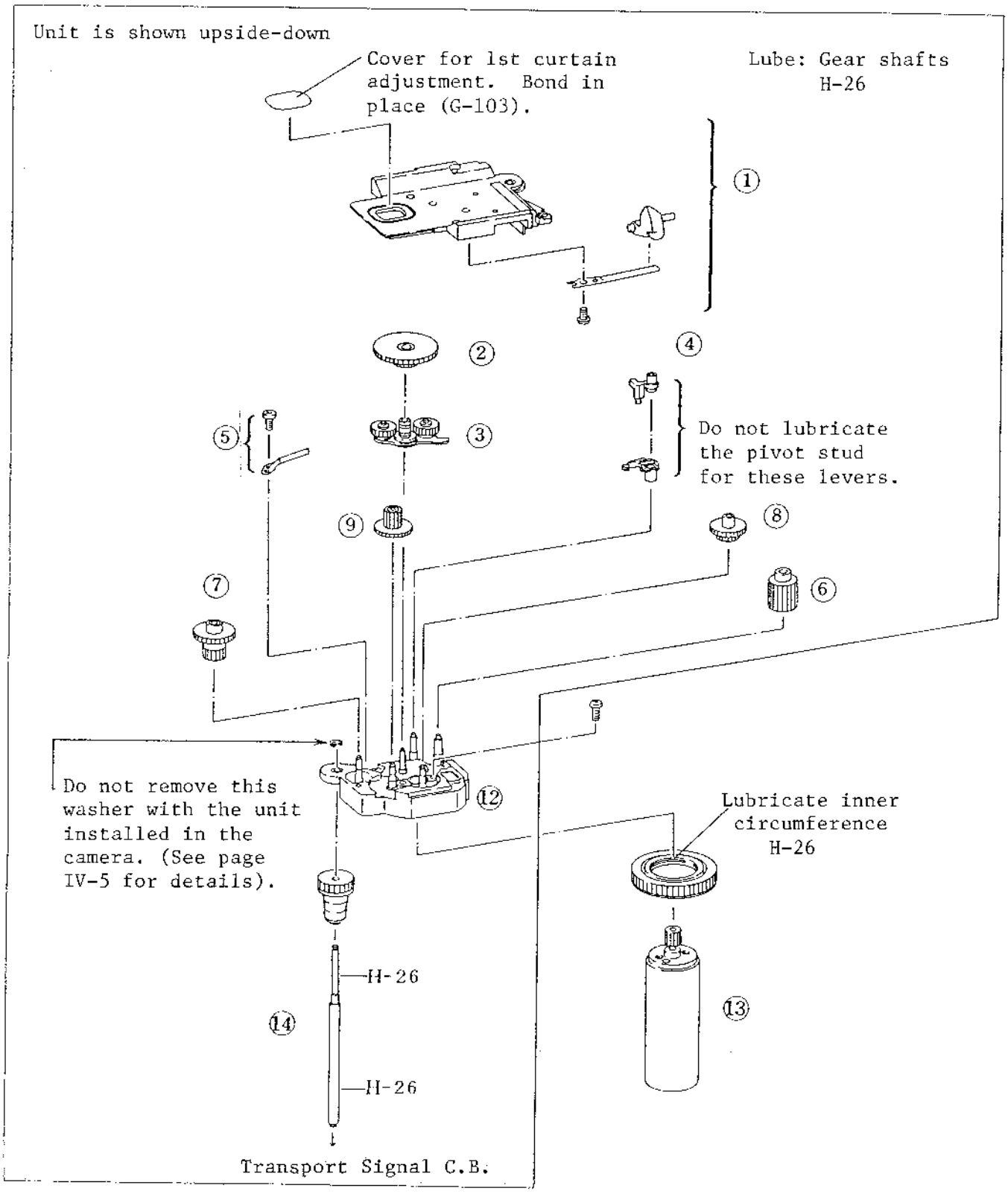



| | |
|---|---|
| ISO Speed ····· 100 | ISO Speed ····· 1000 |
| No. of Exp. ····· 36 | No. of Exp. ····· 24 |
| Latitude ····· +3, −1 | Latitude ····· +1 |

IV Winding Unit

4. Winding Unit Disassembly



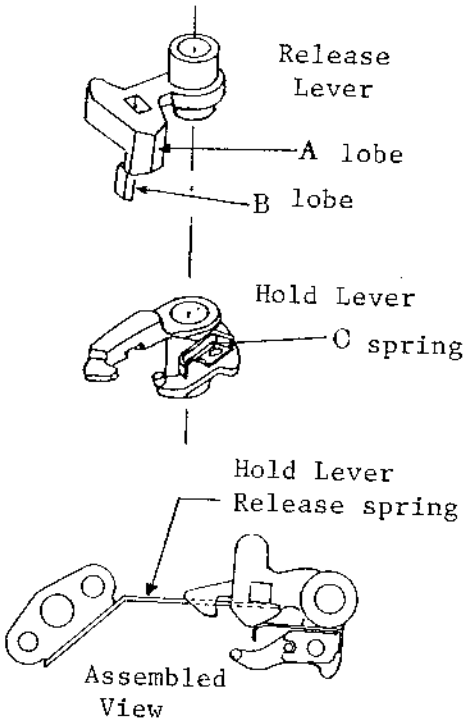
4. Winding Unit Disassembly

## ASSEMBLY & DISASSEMBLY NOTES

1. Mate the release and hold levers as follows.

   A. With tweezers, hold the spring (C) on the hold lever out of the way of the lobe (A) on the release lever and mate the levers.

   B. With tweezers, hold the release lever spring out of the way of the (B) lobe and mount the two levers on the winding baseplate.

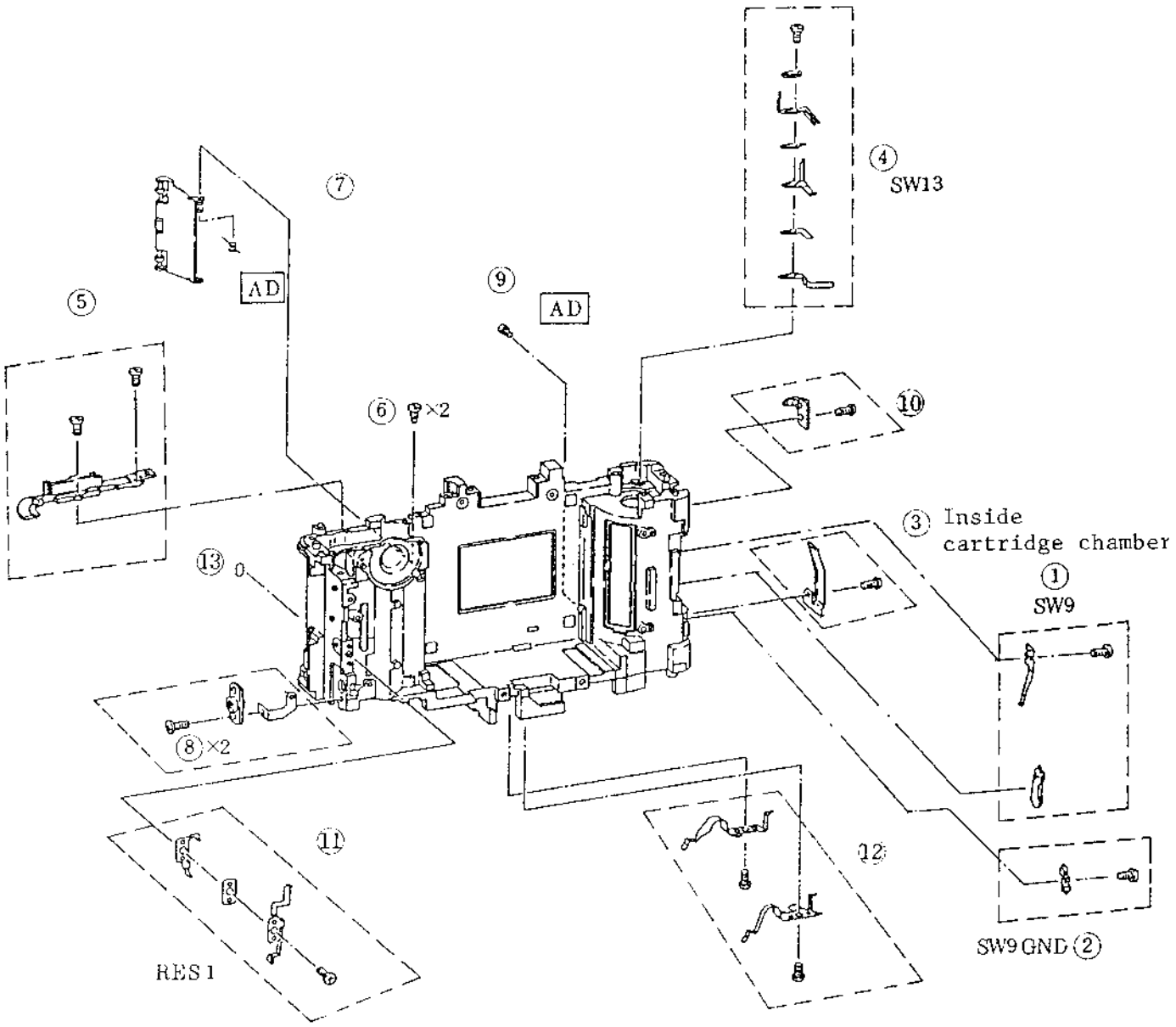



2. The torque of the planetary gear assembly is factory-adjusted. If it is out of tolerances, change the entire assembly.

3. The baseplate (12) can be removed without removing the sprocket shaft (14) by removing retainer (A), but the shaft will be pulled in toward the top of the camera making it impossible to reinstall the retainer. If the retainer is removed by mistake, remove the top cover and move the LCD so the top of the shaft can be depressed and the retainer reinstalled.

# V AL Cover, Contacts, and Minor Body Parts Removal

AD : Adjustments



V AL Cover, Contacts, and Minor Body Parts Removal

## ASSEMBLY & DISASSEMBLY NOTES

1. The AL Cover (7) spring should tension the cover to 60 - 80 grams when lifted off of the spool about 2 to 3mm. If the tension is too weak, the winding will be loose at low temperatures. If the tension is too high, the winding will be loose because the film does not track slightly to one side as it should.

2. The film guide screw head should align with the inside edge of the outer rail within $\pm$ 0.1mm.

   If the screw is replaced, use the same size as removed. If the body is replaced, use a screw whose head meets the tolerances.

VI Flange Focal Distance Adjustment

| ADJUSTMENTS | | |
|---|---|---|
| 1. Standard: | 44.14 ± 0.02mm | to Outer Rails (with optical flat) |
| | 44.17 ± 0.02mm | to center of pressure plate (Record reading for electronic AF adj.) |

2. Tools:

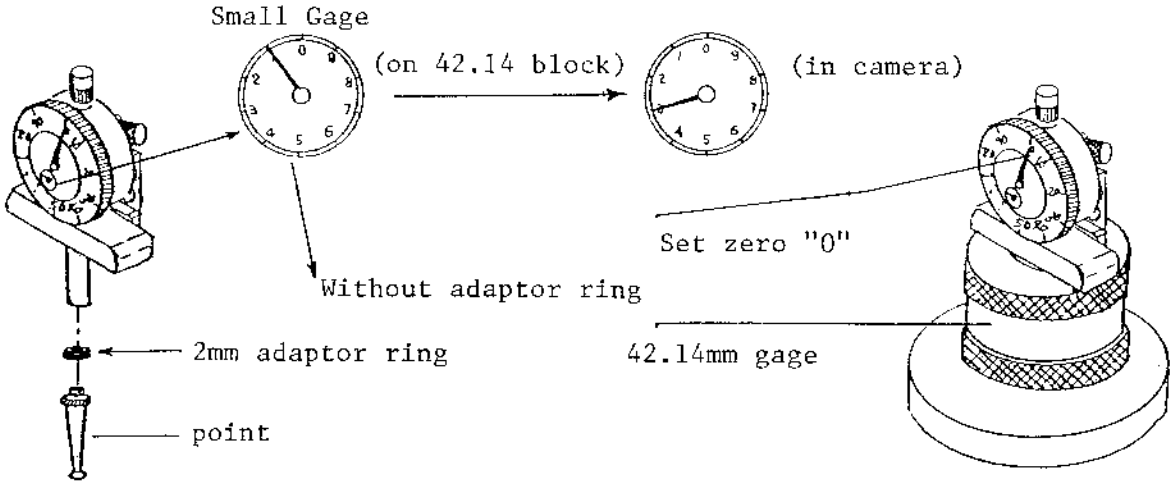
1. Dial Gage
2. 2mm adaptor ring (Extends point for longer EOS FFD)
3. Optical flat (for Block gage)
4. Optical flat (fro camera aperture)
5. Block gage (44.14mm)

3. Adjustment

Set the camera on manual and bulb. Open and hold the shutter open.

If the gage reading is plus, indicating an FFD longer than 44.14mm, install one of the undercut service lens mounts (CY1-1280).

Note: The EOS FFD is 44.14mm*. Previous Canon SLR's had an FFD of 42.14mm*. A new 44.14mm block gage has been made, but the old 42.14 gage and gage point are used. A 2mm adaptor ring is placed between the dial gage and point to increase the reach. If the new block gage is not available, zero the dial gage using the old block gage. The small dial on the gage will read +2mm higher when checking the camera body.



# VII Flange Focusing Screen Adjustment

## ADJUSTMENTS

1. Standard: 44.00 ± 0.02mm

2. Tools:
   1. 90° Mirror Collimator
   2. Correctly adjusted EF50mm f/1.8 lens
   3. Focusing Screen B
   4. Range-viewfinder Collimator 600mm
   5. Magnifier

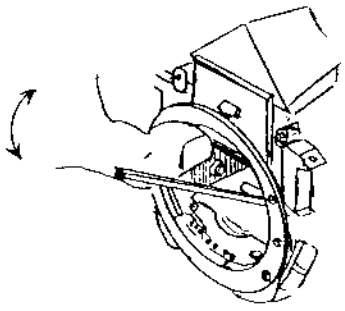
3. Adjustment

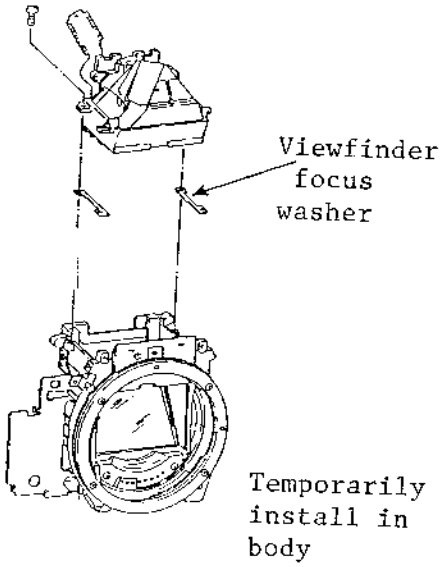
3.1 Install the focusing screen B and set the lens on manual and at infinity. Use the magnifier on the viewfinder.

3.2 Adjust with washers until the collimator lines align in the viewfinder.

3.3 If a collimator is not available and you have good visibility, find a straight-edged target at least 250meters away.

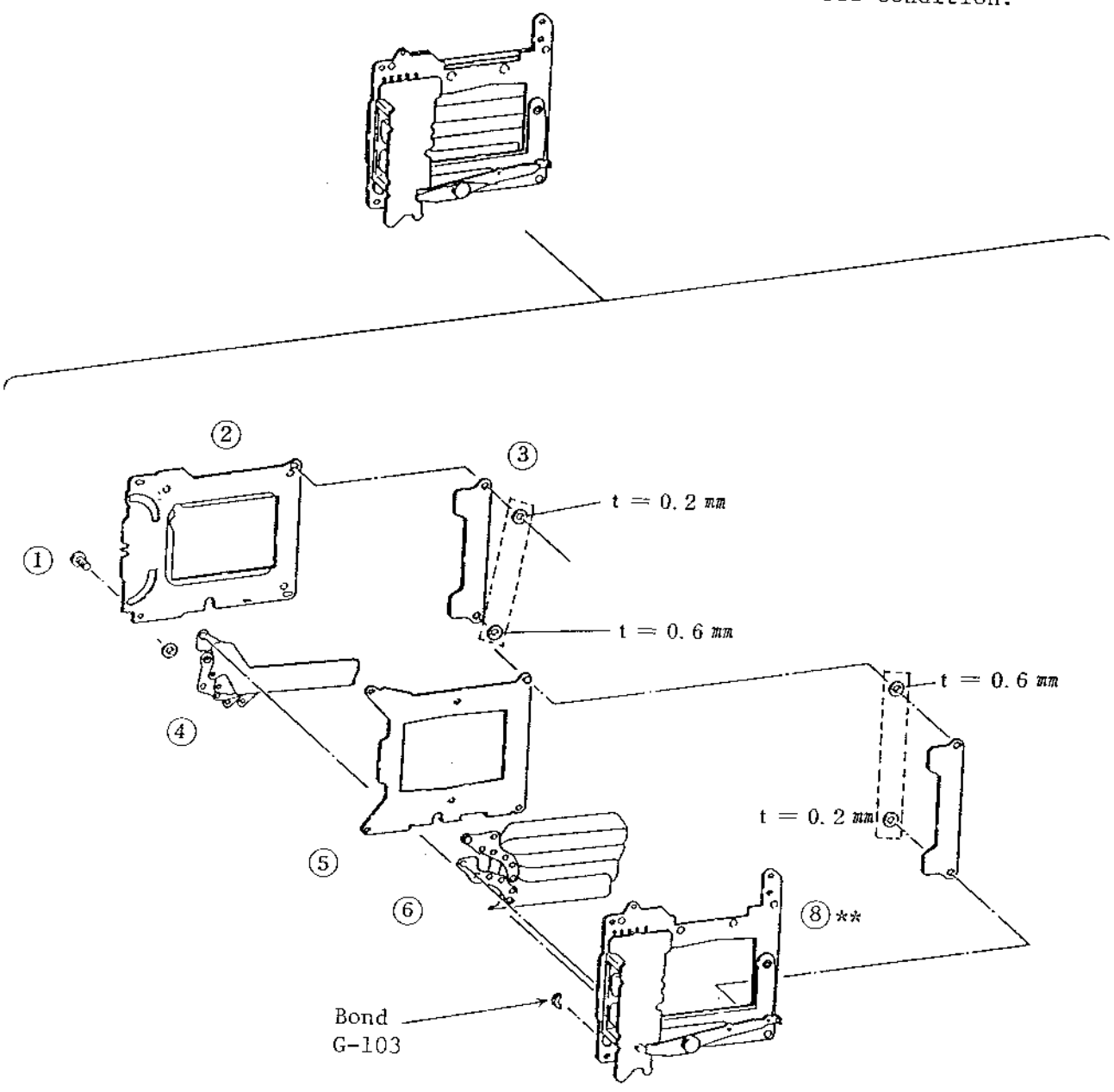
Note: Very slight final adjustment using the main mirror eccentric, but this adjustment should only be used for the final, fine adjustment of less than 0.05mm.





# VIII Shutter Unit Disassembly

When disassembling the shutter to replace the blades, and when reassembling the shutter keep it in the released condition.

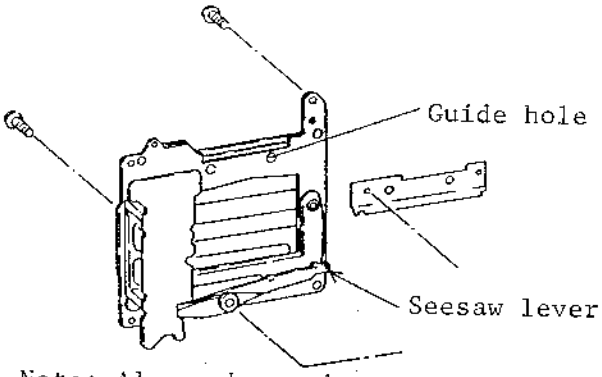



This assembly (8) is factory adjusted. DO NOT disassemble.

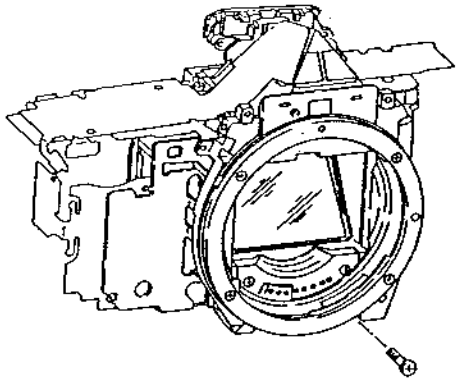
E620 ONLY

VIII Shutter Unit Disassembly

## ASSEMBLY & DISASSEMBLY NOTES

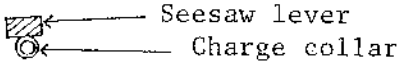



Note: Always have shutter charged during removal and installation.



1. Charge the shutter before removing or installing.

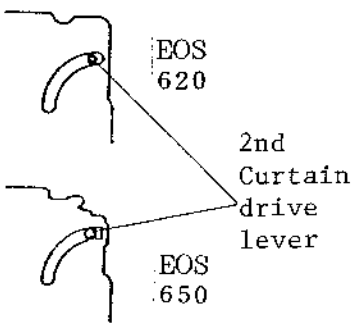
2. Place the guide hole in the shutter unit over the guide pin on the mirror box. Be sure the placement of the seesaw lever and the charge collar are correct.

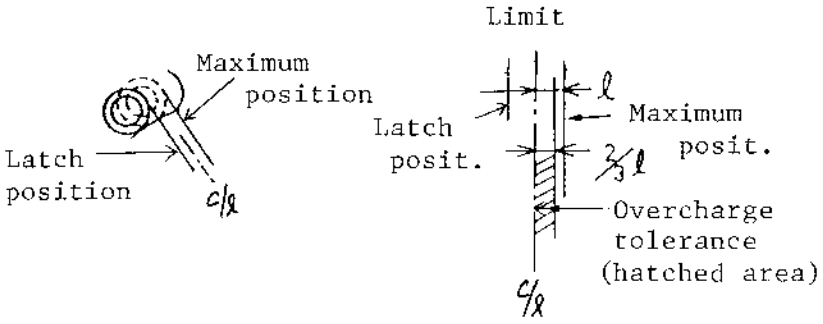



3. When replacing the shutter unit, check the overcharge.

3.1 Install the shutter on the mirror box and push the seesaw lever down as far as possible. At the point, mark the maximum travel position of the pin on the second curtain drive lever (see figure). Next, release the seesaw lever and mark the position of the pin. The difference is the overcharge.

3.2 Apply 2 to 3 volts to M2 and watch the operation of the pin. The overcharge should fall within the hatched area in the enlarged drawing.

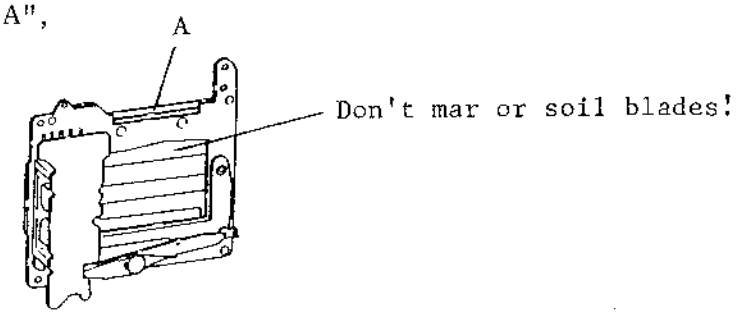


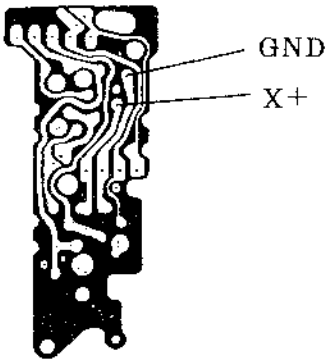
VIII Shutter Unit Disassembly

## ASSEMBLY & DISASSEMBLY NOTES

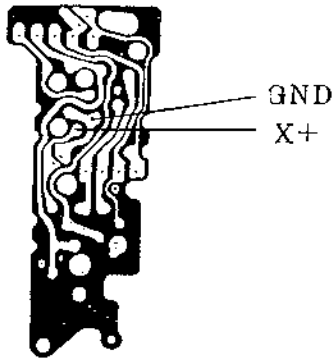
4. Don't touch the blades or at "A", or scratch the blades.




5. The X contact lead connects at the points shown.




EOS650

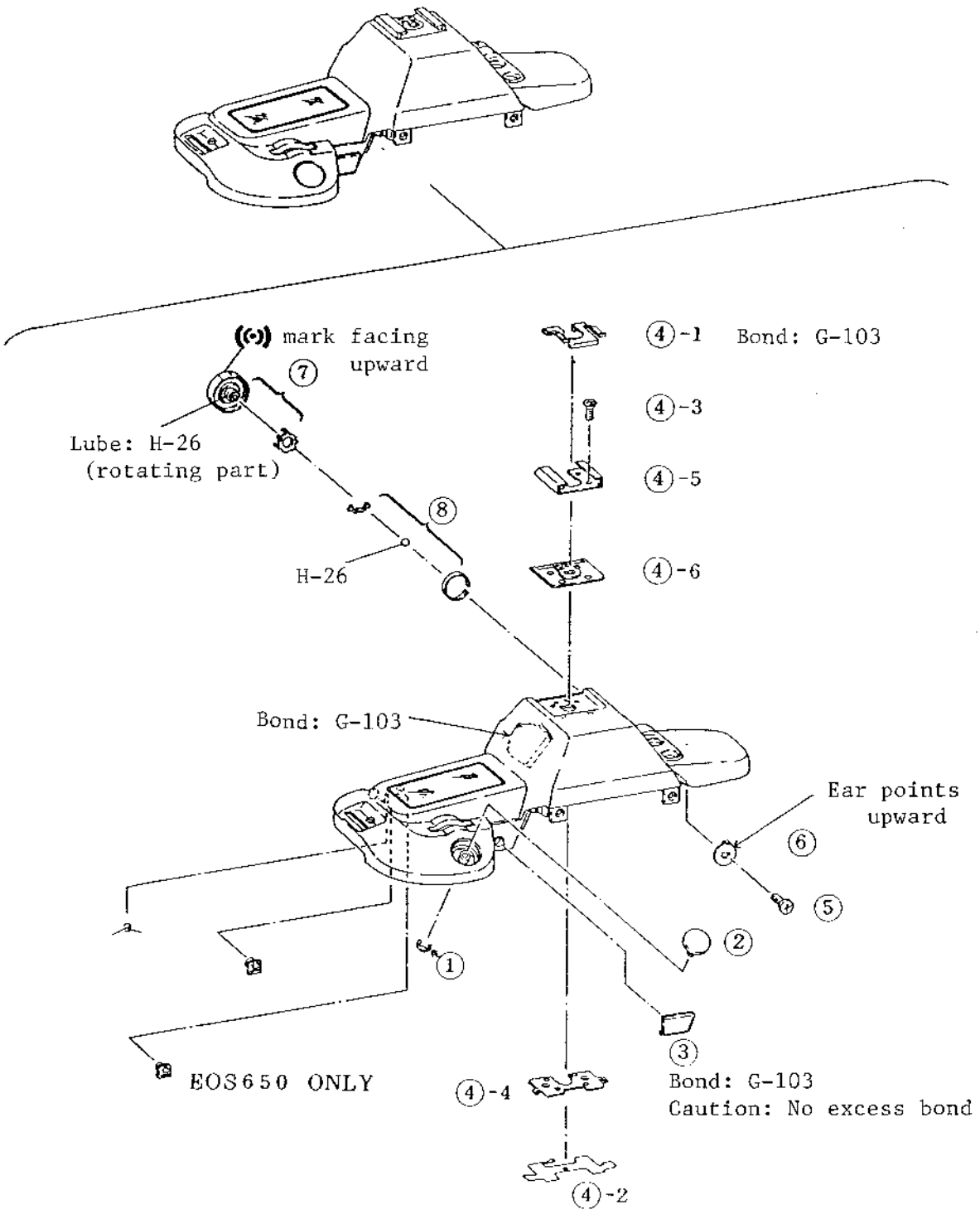



EOS620

6. The second curtain travel time cannot be adjusted on the shutter unit alone. The shutter units are pre-adjusted, but if, for some reason, the spring has been released during repair, the following initial settings will probably give good curtain travel times.

| | From the point where spring hits drive lever | | Curtain Travel Time Adjustment | |
|---|---|---|---|---|
| | 650 | 620 | 650 | 620 |
| 1st Curtain | 18 turns | 11 turns | 0.06ms per turn | 0.8ms 0.8ms per turn |
| 2nd Curtain | Gear 4/5 turn | Worm 21 turns | 1 tooth 0.12ms/ tooth | Worm 0.9ms/ turn |

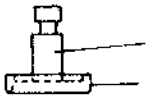
# IX Top Cover Disassembly



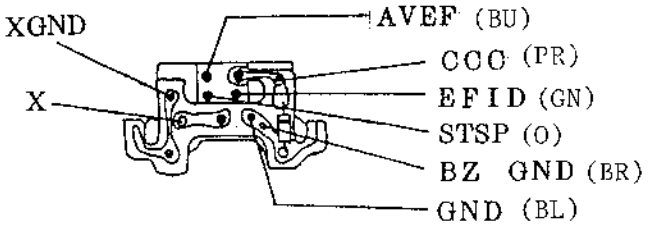
IX Top Cover Disassembly

## ASSEMBLY NOTES

1. Lube the release button (2) shaft with H-26.

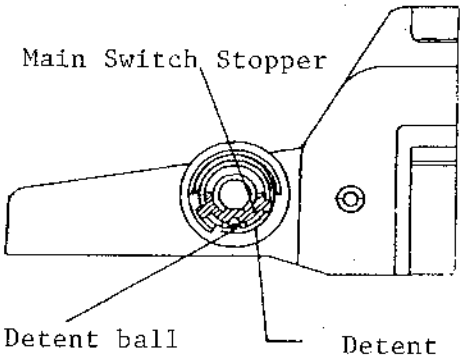



2. After installing the accessory shoe, connect the flex (4)-2 as shown.

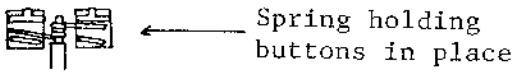



3. When installing the main switch dial (7), the ear on guide (6) and the [ (•)) ] mark should be straight up.

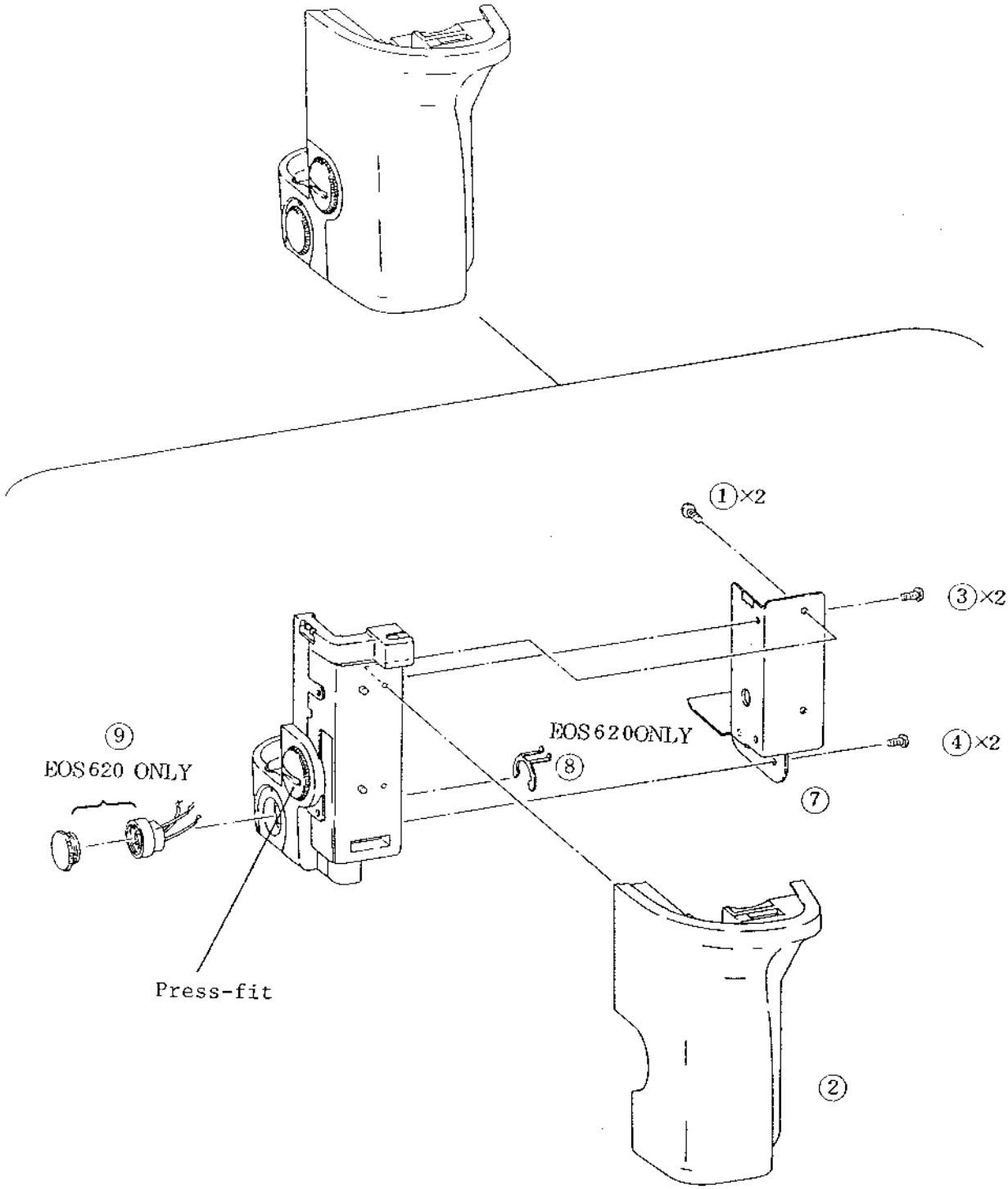
   Assemble the detent parts as shown.




4. Install the AE lock and LCD illumination buttons from the inside and fix in place with the spring.



X Grip Unit Disassembly



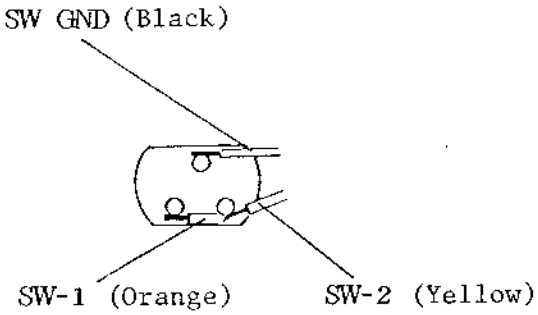
X Grip Unit Disassembly

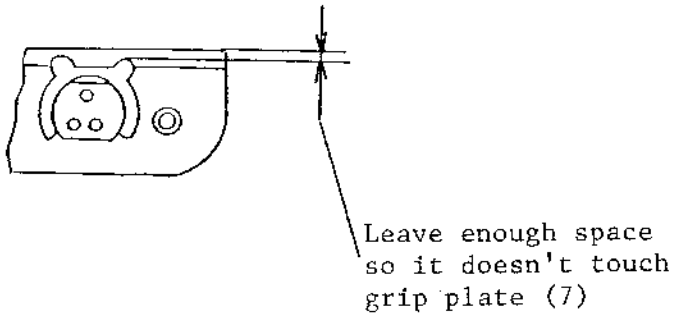
## ASSEMBLY NOTES

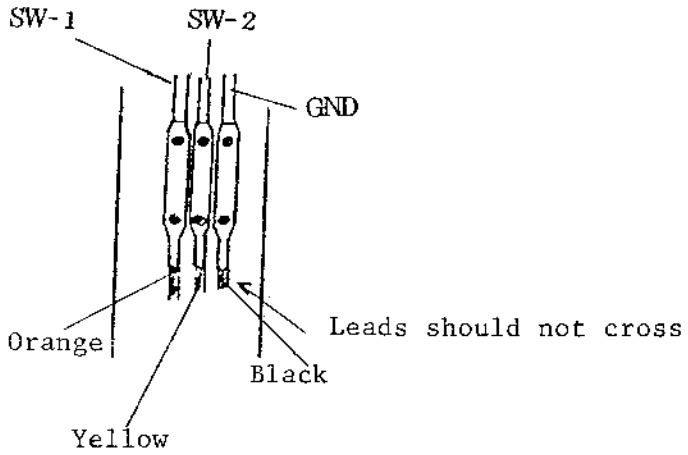
1. When the grip cover (2) is changed, a little H-26 on the ends of the screws makes them easier to install.

2. Solder the leads to the remote connector as shown.

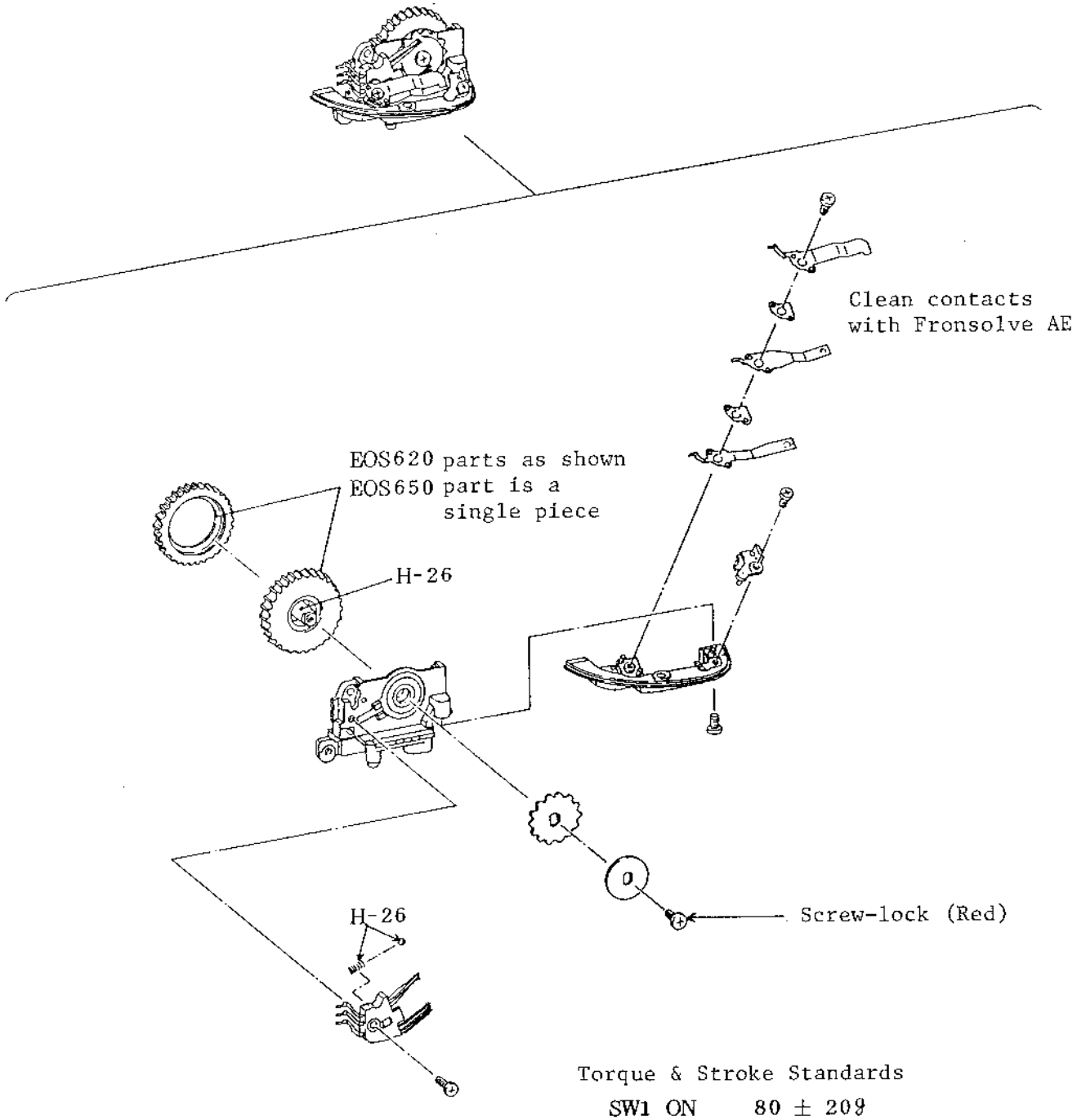
| Switch | Lead Color | OD | Length |
|---|---|---|---|
| SW GND | Black | 0.6mm | 37mm |
| SW-1 | Orange | 0.6mm | 41mm |
| SW-2 | Yellow | 0.6mm | 41mm |



# XI Electronic Dial Disassembly




Torque & Stroke Standards

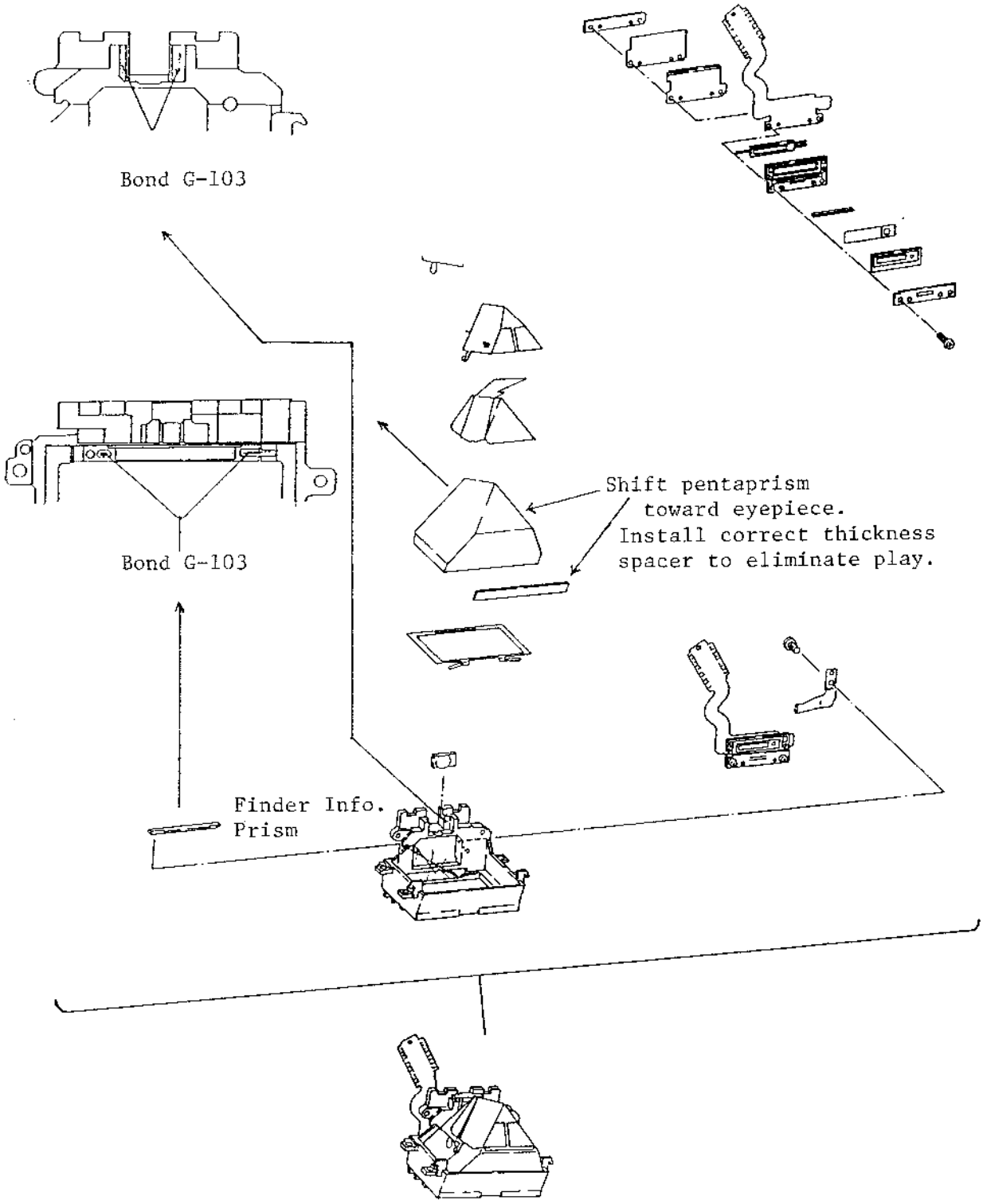
SW1 ON 80 ± 20g

SW2 ON 350g ± 60g

SW1ON ~ SW2ON Stroke: 0.2 mm or over

SW1 & SW2difference200g or over

# XII Pentaprism Unit Disassembly



## XIII Lead Wire Dressing

1. Make sure the yellow VDD lead and the two green MIF leads do not touch the SPD flex portion of the main flex. (They can cause the SPD to become misaligned when the cover is installed.)

2. Bring the leads from the camera bottom up through "A" and along beside the body mount, between the mount and the front panel., (Fig. 2)

3. Dress the leads on the left side (Fig. 3) as shown in the detail drawings.

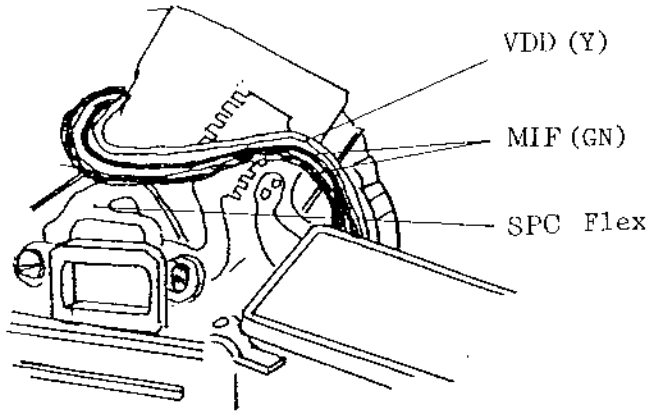



Fig. 1

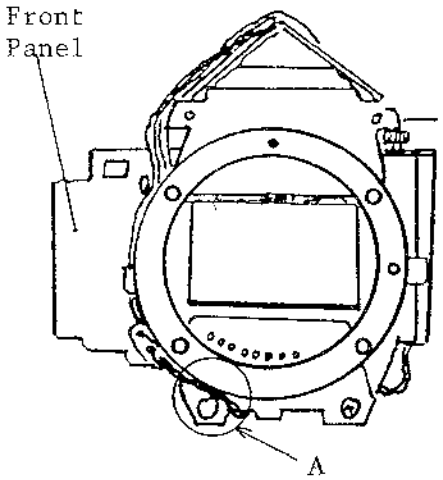
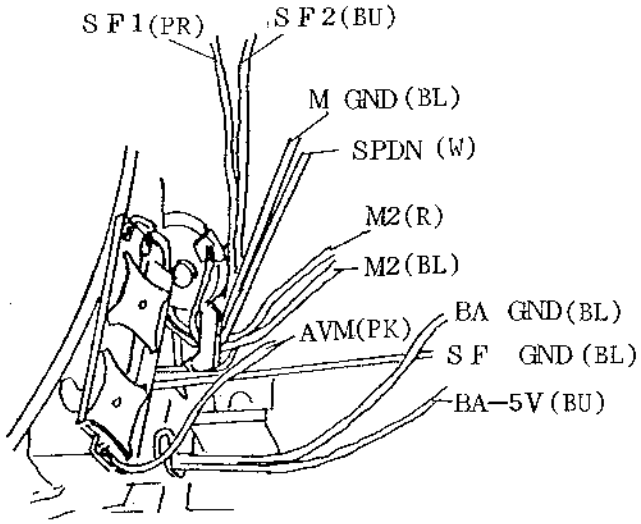
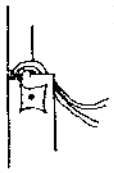



Fig. 2



Dress MGND (BL) & SPDN (W) leads as shown.

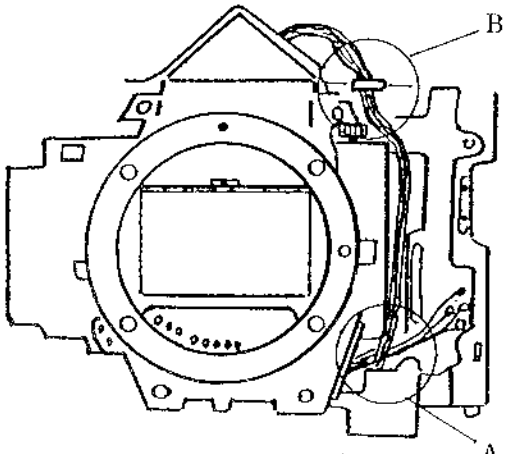
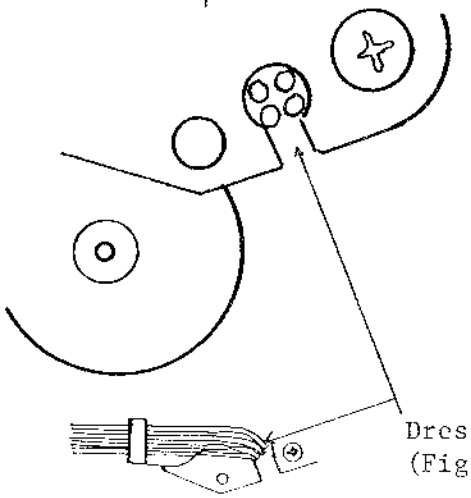
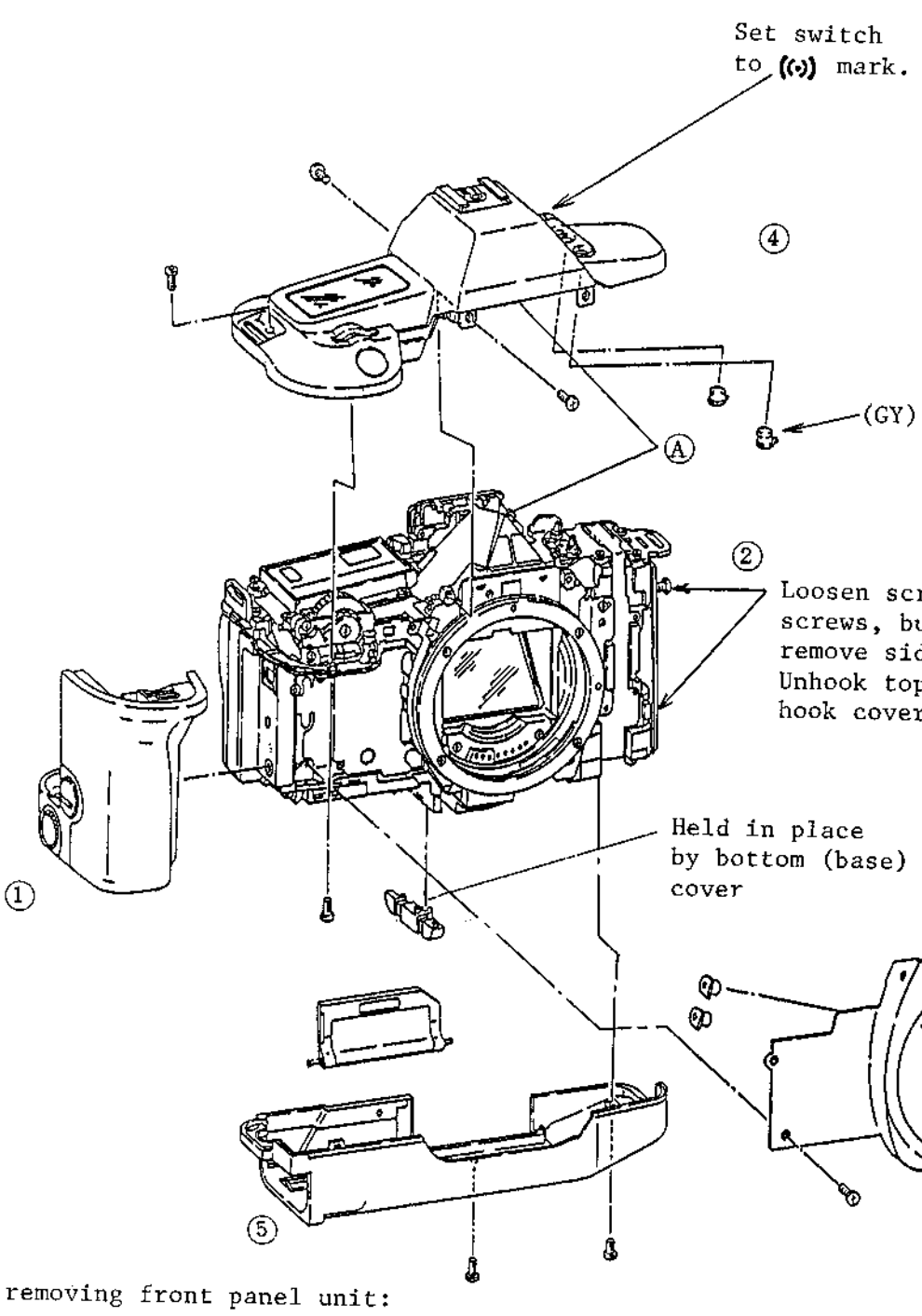
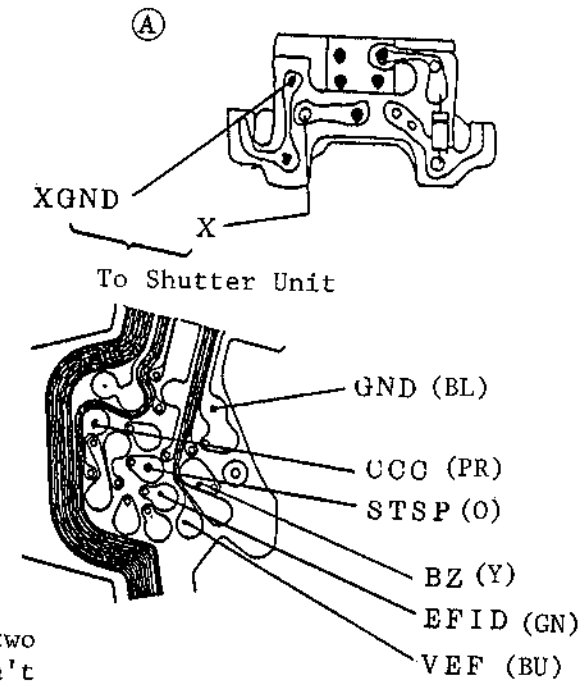



Fig. 3



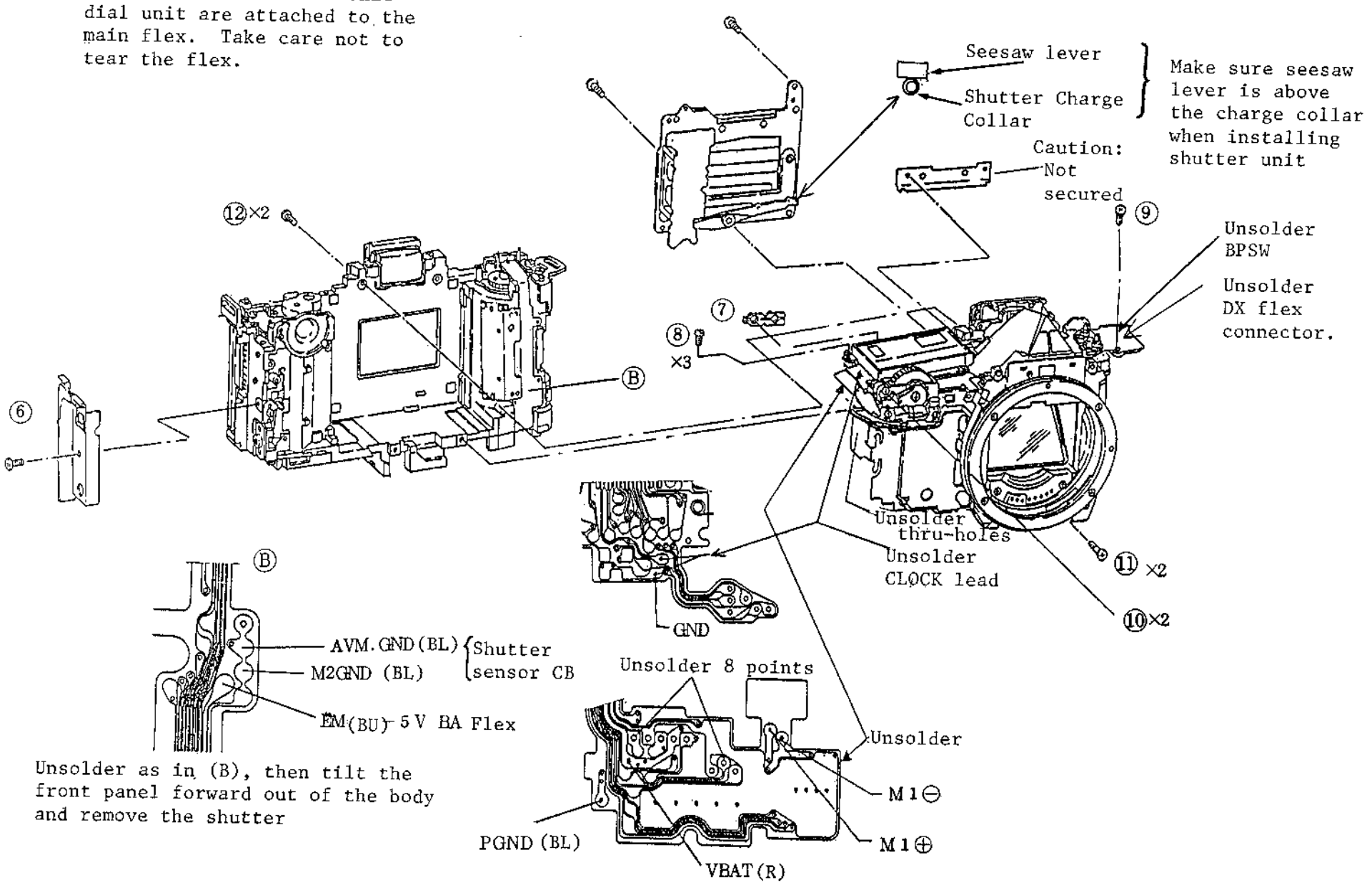
Dress leads (Fig. 3 "B") as shown.




When removing front panel unit:

The LCD unit and electronic dial unit are attached to the main flex. Take care not to tear the flex.




Unsolder as in (B), then tilt the front panel forward out of the body and remove the shutter

# S E R V I C E  T O O L S  L I S T

## C A N O N  EOS 650, 620

| TEST EQUIPMENT | Part No. (New tools only) |
|---|---|
| Extended Range Shutter Tester FS-5300 | |
| TTL-OTF Photoreceptor DIR-201 (used with modified EF 500) | |
| Multi-camera Tester EF 500AC (Modified for DIR-201) | |
| Digital Multimeter (DMM) (1mV, 1uA specs.) | |
| Universal 600mm Range-viewfinder Collimator or equivalent. | |
| Oscilloscope | |
| Regulated Voltage Power Supply (LVPS) | |
| Universal Type 90° Collimator or Simplified 90° Collimator | |
| Dial Tension Gauge - 10g | |
| 1.3mm Hex Key (Mirror Angle) | |
| EOS Tool (all electrical adjustments) | CY9-1070-000 |
| EOS TOOL accessories | |
| Memory Card / Cassette Tape 650 4A(J) | CY9-1079-001 |
| Memory Card / Cassette Tape 650 4A(E) | CY9-1079-002 |
| Memory Card / Cassette Tape 650 6A(J) | CY9-1079-003 |
| Memory Card / Cassette Tape 650 6A(E) | CY9-1079-004 |
| Memory Card / Cassette Tape 620 (J) | CY9-1079-005 |
| Memory Card / Cassette Tape 620 (E) | CY9-1079-006 |
| Focusing Rail | CY9-1071-000 |
| AF Standard Tool Lens | CY9-1072-000 |
| Mount Adaptor | CY9-1073-000 |

| | |
|---|---|
| 44.14mm Block Gauge | CY9-1001-007 |
| 2mm Adaptor Ring (Dial gage) | CY9-1001-008 |
| Main Mirror Adjustment Mirror | CY9-1074-000 |
| LCD Protective Cover | CY9-1075-000 |
| Sub-mirror Adjustment Mirror | CY9-1076-000 |
| Tool Focusing Screen | CY9-1077-000 |

AF Standard Reflectance Charts (A-4 size)

| | |
|---|---|
| 2% (Black) | (CY9-1066-000) |
| 64% (Light Gray) | (CY9-1067-000) |
| 90% (White) | (CY9-3053-000) |

Parts to build dummy battery adaptor for LVPS

| | |
|---|---|
| Top cover | CY4-0071-000 |
| Bottom cover | CY4-0072-000 |
| Contact (2 ea.) | CY4-0073-000 |

Expendables

| | |
|---|---|
| Diabond (G103) | CY9-8002-000 |
| Screw-lock (Blue) | CY9-8012-000 |
| Aron Alpha | CY9-8007-000 |
| Silicone Bond (KE347B) | CY9-8064-000 |
| IF-10 | CY9-8088-000 |
| Electro-oil 190 | CY9-8089-000 |
| H26 | CY9-8079-000 |
| OBF-10 oil retardant (lens mount) | CY9-8051-000 |

Tools for Local Fabrication

The following tools are necessary for repair and adjustment of the EOS 650 and 620. They are simple to make and parts are available from Canon, when necessary.

1. Charts (Targets) for AF alignment

   Chart paper (2%, 64%, & 90%) is available from Camera Service. If necessary clean, white paper (copy paper) can be used for 90% charts and a fair 2% black can be made by running the same paper through a copier with the lid open several times. For 64% light gray, the paper available from Camera Service should be used.

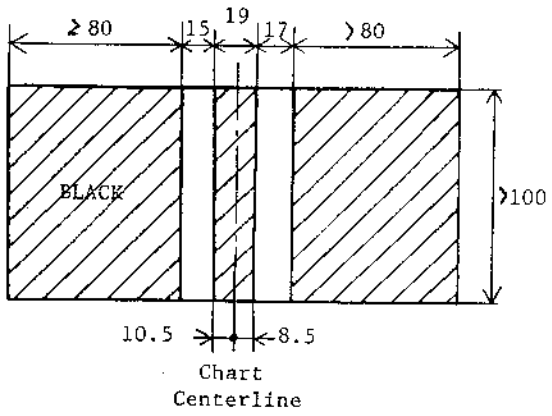
   Construct the charts of a base of flat material. Heavy paper, wood, plastic, or metal is appropriate. If metal, which has the best flatness, is used, cover with a low reflection paper before applying the chart. The unit is millimeters (mm) and the tolerance for all except overall dimensions is $\pm$ 0.5mm. Overall dimensions are minimum dimensions.

UNIT: mm

A. AF Standard Double-bar Chart

To prevent problems deriving from shadows caused be paper thickness, put white parts of the chart over the black background.

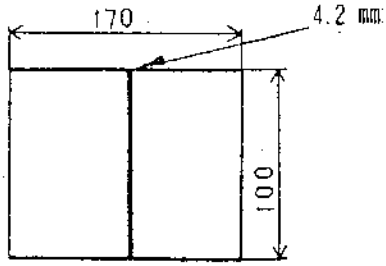
A.




B. Parallax Chart

This chart is best made by inking a 4.2mm black line on white paper.

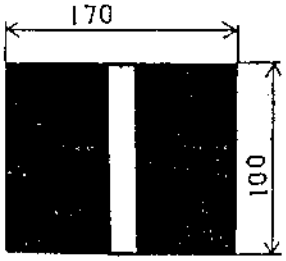
B.




C. Single-bar Chart

On a black (2%) base, apply a 16mm white strip in the center.

C.

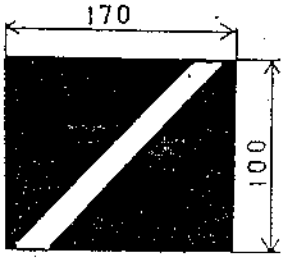



D. 45° Bar Chart

As "C", but with the 16mm white strip running diagonally from the lower right to upper left corner.

Angle: $45^{\circ}\ ^{+0}_{-1}$

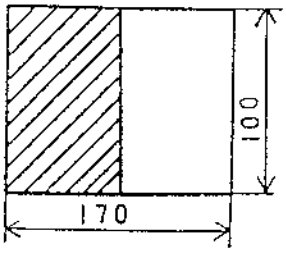
D.




E. 90:64 Low Contrast Chart

Make the chart with half white (90%) and half light gray (64%). Do not overlap the paper or leave any space between them.

E.



2. Dummy Battery Adaptor For LVPS

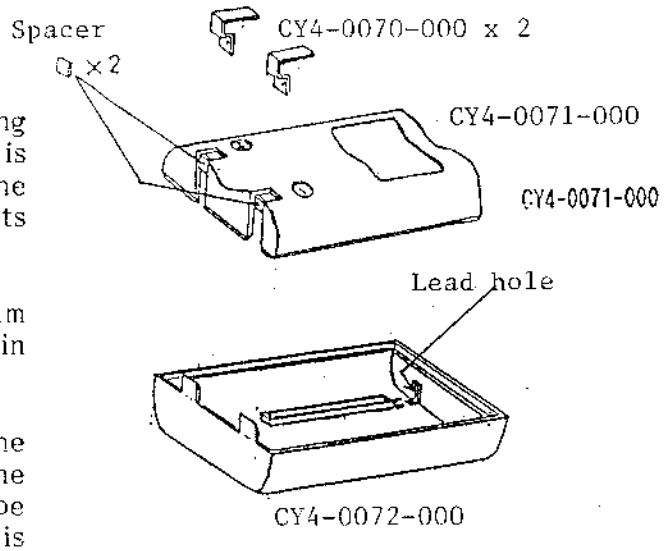
A dummy battery adaptor for applying power from a regulated power supply is quite handy when working on the camera. It can be made from parts available from Camera Service.

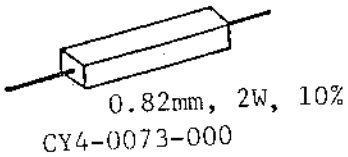
Make to spacers 3 X 3mm, 0.2mm thick from metal or plastic and bond in place with instant bond.

Cut a hole in the back end of the lower case. With the hole in the position shown, this adaptor can be used in the compact camera using this battery.

Install two leads [red (+) and black (-)] through the hole. Install the contacts and solder the appropriate lead to the contact. Close the case and fix with bond. Terminate the ends of the leads as necessary for your work station.

Note: The 0.82 ohm, 2W resistor is used for checking current flow.

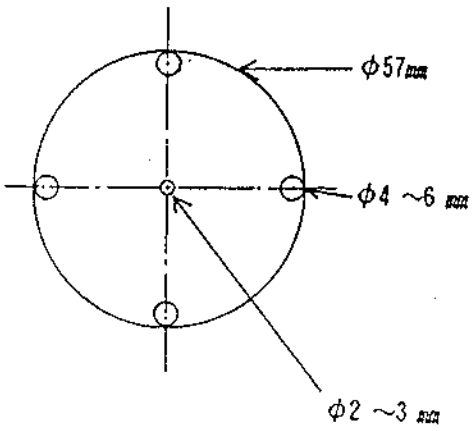



3. SPC Positioning Mask

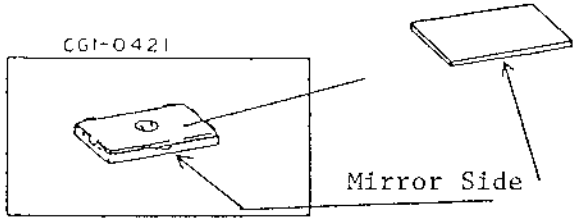
Using a piece of opaque plastic or the like about 100mm square*, draw a circle of 28.5mm radius. At each of the four quadrants, cut identical 4 to 6mm diameter holes touching the circle. Drill a 2 to 3mm diameter hole at the center, also.

*: This mask is used in front of a light source such as the light source of the EV tester. The mask should be large enough to cover the light.

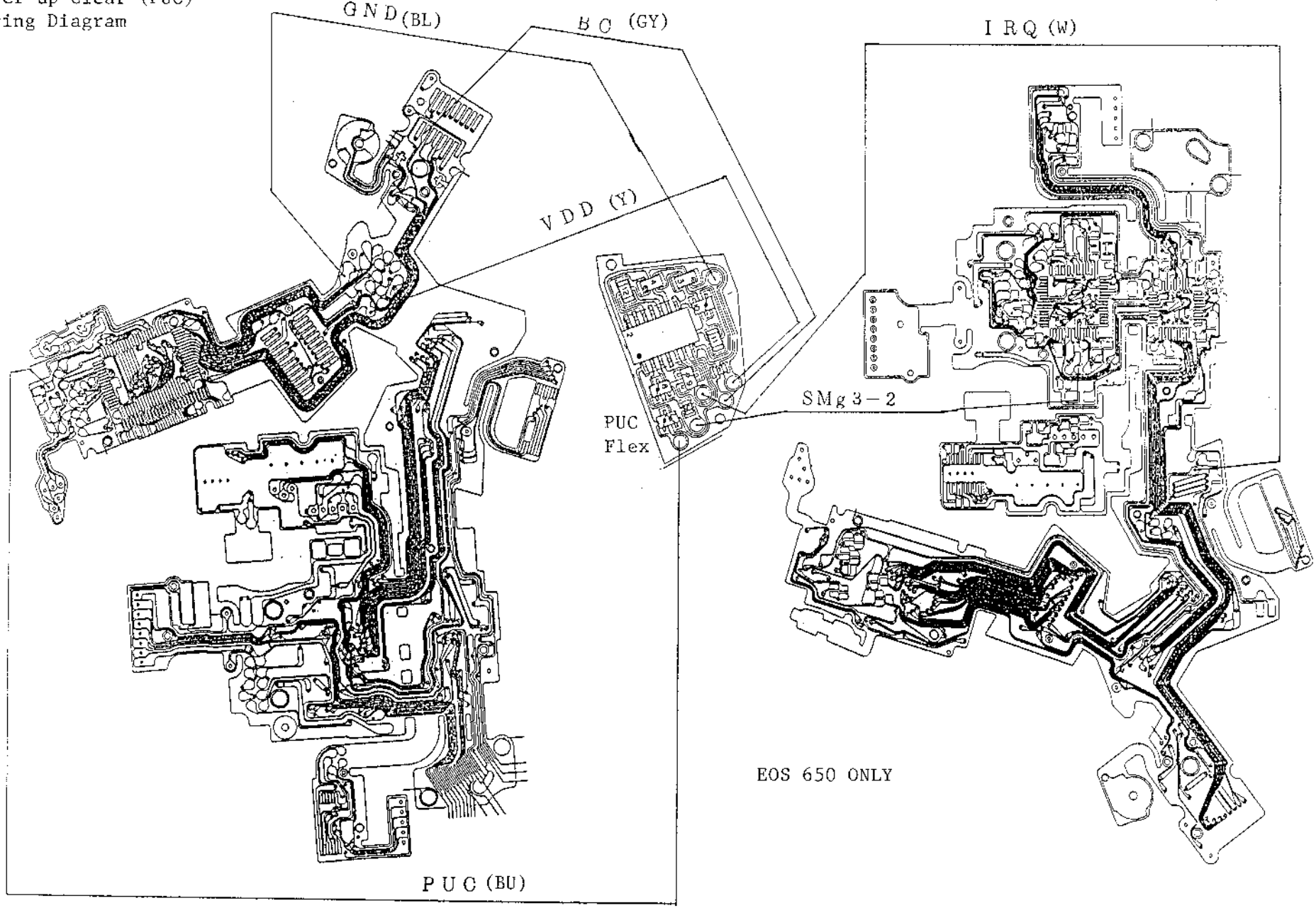



4. 90° Collimator Mirror Unit

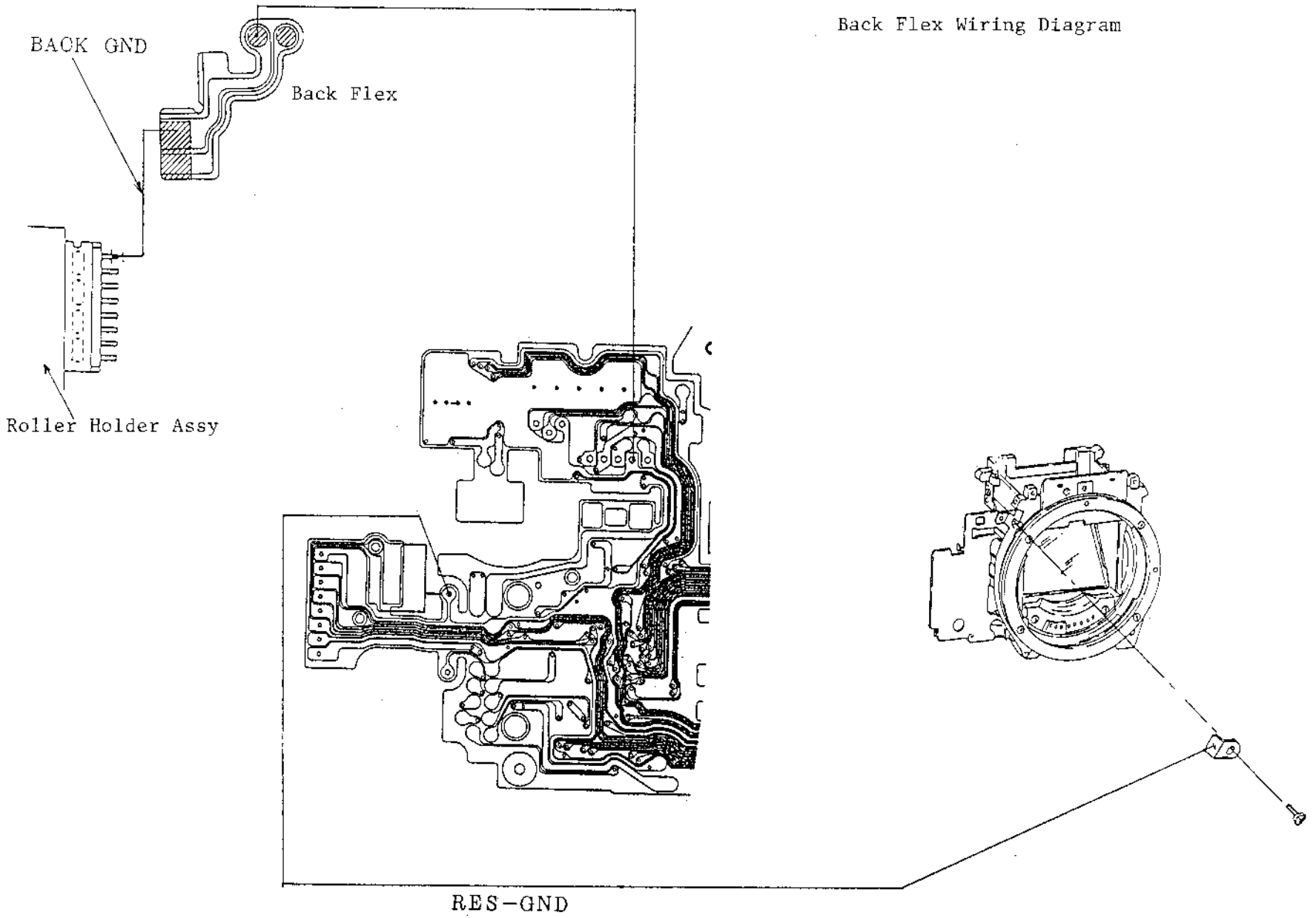
Replace the focusing screen in the normal focusing screen unit (CG1-0421) with the mirror (CY9-1074). This unit is used with the simplified 90° collimator



Power-up Clear (PUC)
Wiring Diagram



Back Flex Wiring Diagram



# EOS 650 & 620 ELECTRICAL ADJUSTMENTS

## PREFACE

The electrical adjustments of the EOS 650 and 620 cameras can only be accomplished using the EOS TOOL, a modified personal computer. Before attempting to operate the EOS Tool, read part 1 (the instruction manual) completely.

### Manual Organization

Chapter I: EOS TOOL INSTRUCTION MANUAL

This chapter describes the precautions necessary when using the EOS tool. Step-by-step instructions are designed so no previous experience is necessary, but reading the instructions carefully before starting is recommended.

Note: The retrofit using a ROM card instead of the previous RAM card makes programming using a cassette unnecessary.

Chapter 2: EOS 650 & 620 ELECTRICAL ADJUSTMENTS

This part contains the actual adjustments of the cameras. It is used in conjuction with the Assembly, Disassenbly, and Mechanical Adjustments portion of the Service Manual.

Chapter 3: HELP!

This chapter is useful when you need help, or if an unknown prompt is displayed.

**WARNING**

This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instruction book, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of the FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of the equipment in a residential area is likely to cause interference, in which case the user, at his own expense, will be required to take whatever measures may be required to correct the interference.

Third Edition, June, 1987

# EOS 650 & 620 ELECTRICAL ADJUSTMENTS

## (EOS TOOL INSTRUCTIONS)

CONTENTS Page


Chapter I EOS TOOL INSTRUCTION MANUAL

1 Features..... I-1

2 Preparations..... I-1

2-A Components..... I-1

2-B Preparations..... I-1

3 Controls and Indicators..... I-3

4 Battery replacement..... I-5

5 Connecting to the camera..... I-6

Chapter II ELECTRICAL ADJUSTMENTS

1 Introduction..... II-1

1-A EOS Tool Function Diagram..... II-3

1-B Adjustments vs Replacement Parts..... II-4

2 Prelimionary Operations..... II-5

3 Termination..... II-9

4 Shutter adjustment..... II-10

5 AE adjustment..... II-14

5-A Adjustment..... II-15

5-B Biasing exposure customer preference..... II-18

5-C SPC position adjustment..... II-20

6 Inhibit voltage adjustment..... II-23

7 Rewind adjustments..... II-26

8 AF adjustment..... II-29

8-A Initial adjustment..... II-31

8-B Parallax adjustment..... II-34

8-C AF focus adjustment..... II-36

8-D Sensor graph output..... II-41

8-E Defocus amount output,..... II-44

8-F AF precision check..... II-45

8-G Unresolved focus problems..... II-49

9 OTF accuracy adjustment ..... II-51

10 IC-4 replacement..... II-54

10-A Initialization ..... II-54

10-B Camera to EOS tool communication..... II-56

10-C EOS tool to camera communication..... II-58

Chapter III HELP! ..... III-1

# I. EOS TOOL INSTRUCTION MANUAL

## 1. Features

The EOS Tool is a personal computer, modified specifically to serve as the adjustment device for the EOS cameras. These cameras can be adjusted simply by inputting correcting data from the tool. The tool is simple to use, but it is a great departure from previous practice so this manual should be studied carefully before actually using the tool.

## 2. Preparations for Use

### 2-A Components

The EOS Tool is composed of the following units:

1. EOS Tool body
2. Grip Unit (w/ attachment screw)
3. Instruction Manual
4. Battery (SUM3 x 4).

### 2-B Preparations

This device is designed as an interactive system so that you can adjust by following instructions (prompts) displayed on the LCD panel, after completing the following preparations.

The EOS tool has no program in itself. The program when operating is in the memory card. The master program is on a compact cassette tape. See "Loading from cassette tape" below for details.

When you practice with or use the EOS tool, you should first load the camera data. See part II, section 10, IC-4 Replacement, step 2: Camera ——> EOS Tool. By loading the data, all data set at the factory can be stored in the device. Thus, if you inadvertently destroy some data in the camera, you can recover it from the EOS Tool.

If the main flexible circuit board or IC 4 will be replaced, we recommend that you load the camera data into EOS tool before disassembling. This will decrease the number of adjustments necessary after replacement.

When a communication error occurs between the EOS tool and the camera, the prompt "I/O Error" is displayed. In this case, clean the contact points between the grip unit and camera, and between the EOS tool and the grip unit, then execute again (See the HELP section for further details).

The EOS tool must be disconnected from the camera only when the camera is in normal operating condition, where the shutter will release.

When the tool is communicating with the camera, you can confirm by the blinking transmit and receive LEDs.

If the LCD display does not change for a long period or the receive LED does not blink, this is a communications error. (See the HELP! section for further details.)

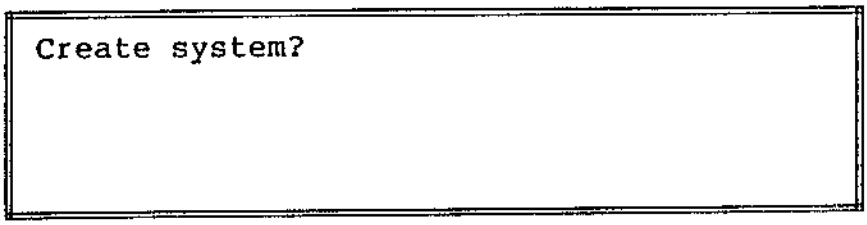
To terminate the EOS tool, depress the power off switch (white). The camera may not operate in this case. If the shutter will not release, loosen and retighten the grip screw once. This is the reset switch.

If "Low Battery" is displayed on the LCD, the battery is nearly empty. Replace it as soon as possible.

See Chapter I, section 5 "Battery Replacement" for details.

After adjustment is completed, the camera's display or operation may be abnormal. In this case, remove the tool's grip unit, remove the battery, and install the cameras grip unit. Always operate the reset switch whenever removing the battery. (The grip units attachment screw is the reset switch activator.)

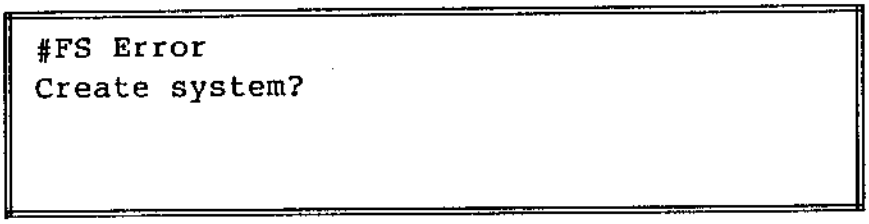
When you replace memory card and turn the power on, the prompt shown below may be displayed. If so, proceed as follows.




Y

R E T U R N

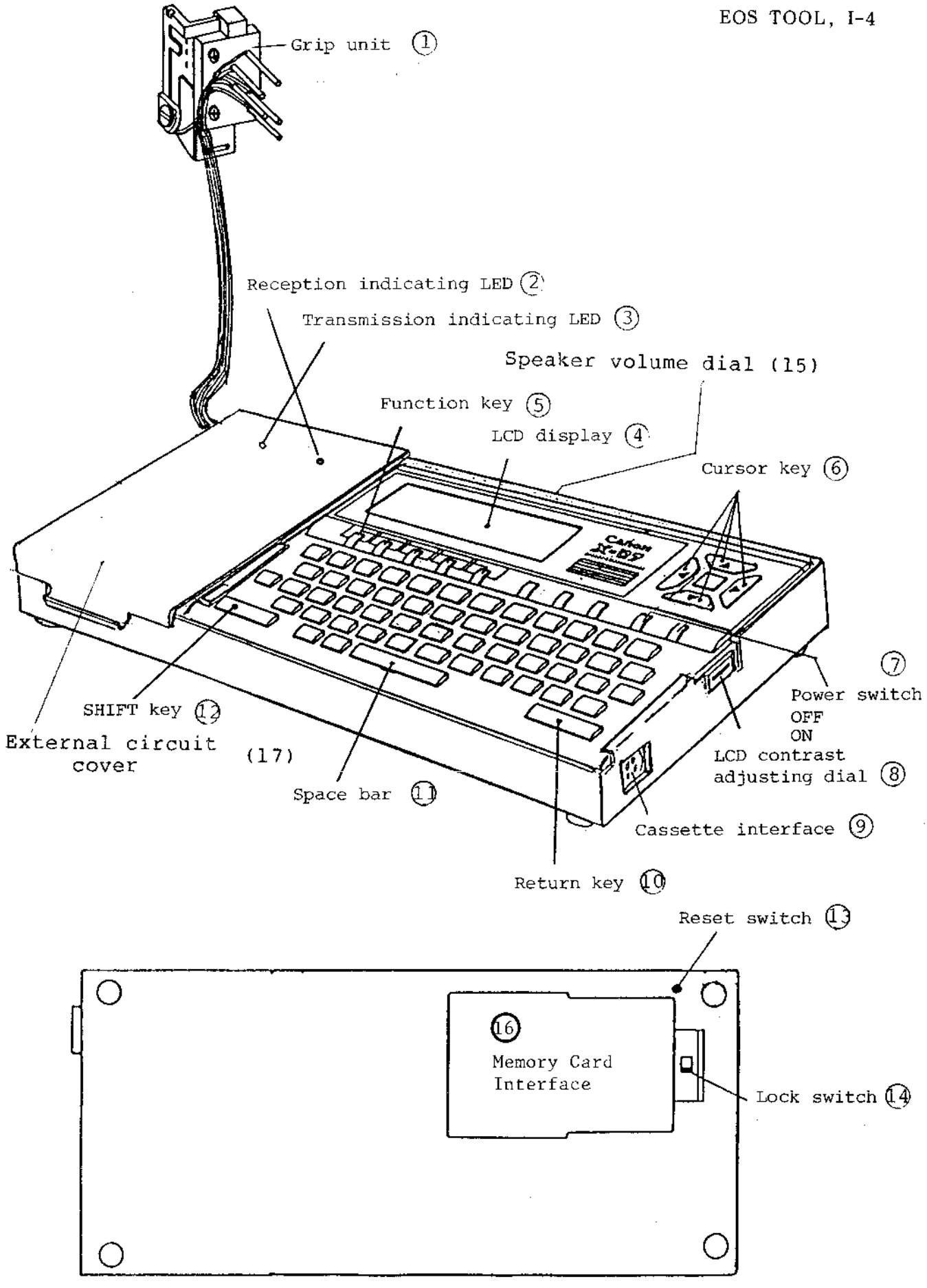
When the prompt shown above is displayed, depress the Y and RETURN keys in sequence.




If this prompt is displayed, which is unlikely, press the Y and RETURN keys in sequence.

3. Controls and Indicators

| | |
|---|---|
| (1) Grip Unit | This unit replaces the cameras grip and provides the connections to the camera circuit. The mounting screw is also the activator for the camera's reset switch. |
| (2) Receive LED (Green) | Blinking indicates reception in progress. |
| (3) Transmit LED (Red) | Blinking indicates transmission in progress. |
| (4) LCD Panel | This liquid crystal display panel is the communication link between the tool and the repairperson. |
| (5) Function keys | The functions can be selected by these keys. |
| (6) Cursor keys | These keys are used for moving the screen up or down to select an adjustment. They also move the cursor during certain adjustments. |
| (7) Power switches | The two power switches are side by side. The ON/BREAK button is orange, and the OFF white. |
| (8) LCD contrast | This dial adjusts the LCD panel contrast. |
| (9) Interface | Not used with new memory card. |
| (10) RETURN key | This is the forward command key. |
| (11) Space bar | This bar is used for moving back one step (back-down key). |
| (12) Shift key | This key is used to shift to functions F6 to F10. |
| (13) Reset switch | This switch resets the circuit when loading a program from the cassette tape into the EOS tool. |
| (14) Lock switch | This switch is for locking the memory card interface mounting slide in place. It is also the main power switch. If this switch is off, the tool will not operate. |
| (15) Volume dial | Sets beeper volume. |
| (16) Memory card interface | The new ROM card mounts in this interface. |
| (17) External circuit cover | The special circuits for communicating with the camera and the battery are located under the cover. |


Grip unit ①
Reception indicating LED ②
Transmission indicating LED ③
Speaker volume dial (15)
Function key ⑤
LCD display ④
Cursor key ⑥
⑦
Power switch
OFF
ON
LCD contrast
adjusting dial ⑧
SHIFT key ⑫
External circuit
cover (17)
Space bar ⑪
Cassette interface ⑨
Return key ⑩
Reset switch ⑬
⑯
Memory Card
Interface
Lock switch ⑭

4. Battery Replacement

If "Low Battery" is displayed in the LCD, it is time to replace the battery. When power is removed, the memory is cleared. To change the battery without clearing the memory, use the following procedure.

Note: When you use the EOS tool for the first time, the following procedure may be omitted.

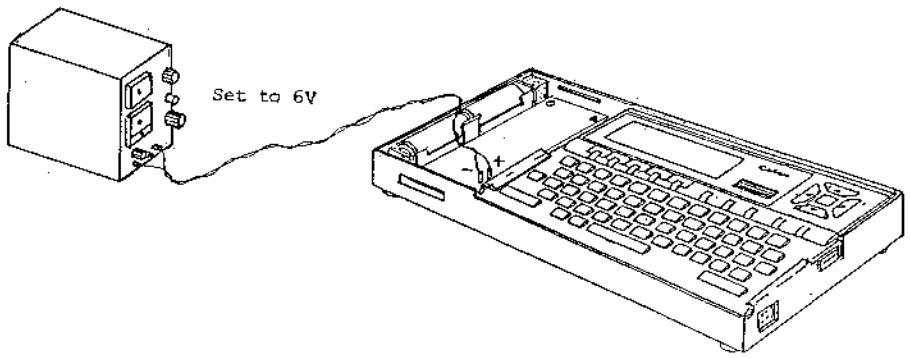
Remove the external circuit cover and connect the external power supply to the terminals as shown.

Set the output of the power supply to 6 volts and turn on the power.

Replace the cells in the battery magazine.

Remove the external power supply.

Reinstall the cover.



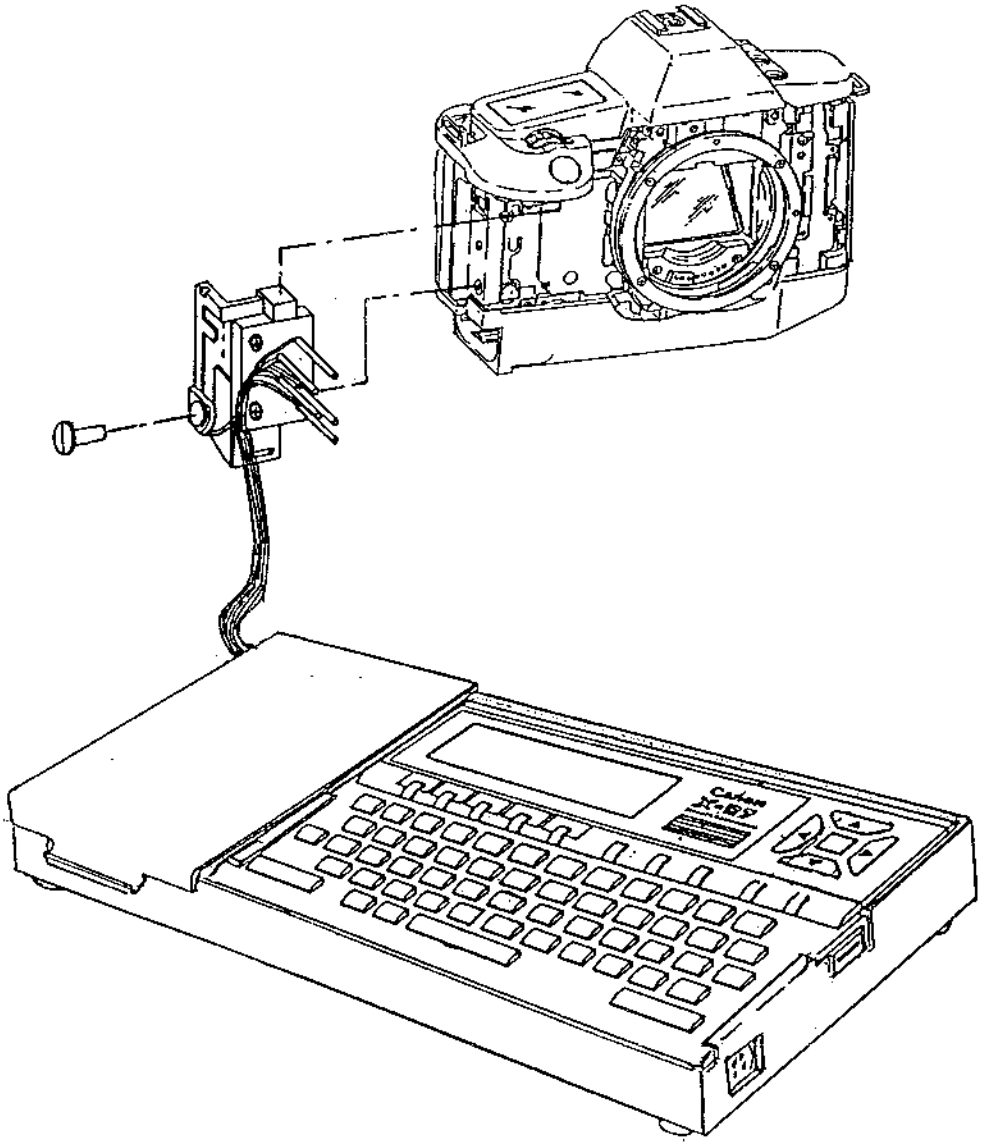
5. Connecting to Camera

   1. Detach the grip and front cover of the camera (Disassembly, section I).

   2. Attach the grip unit to the camera.

   3. Connect the grip unit cable to the tool. It can only be installed one way.

   4. The receive (red) LED should light. (On some units it may not light if the switch is off.)

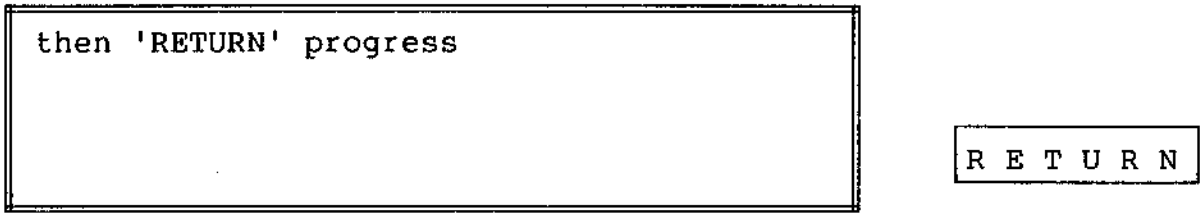


# II ELECTRICAL ADJUSTMENTS

## 1. Introduction

This EOS tool is designed as an interactive system, so that it is possible to adjust the camera without referring to this instruction manual by following the instructions prompted on the LCD display.

Throughout this manual, the LCD panel, as it will appear at that point in the operation, is shown on the left side of the page. On the right side of the page, the key which must pushed to proceed is shown on the right.




When the key is indicated as F1 - F5, the appropriate function key should be pressed. [F1]~[F5]

When the indication shown below is indicated, simultaneously press the shift key and one of the function keys. This gives access to functions F6 (key F1) through F10 (key F5).

[SHIFT]+[F1]~[F5]

When you want to continue an operation, press the key displayed on the LCD or the RETURN key.

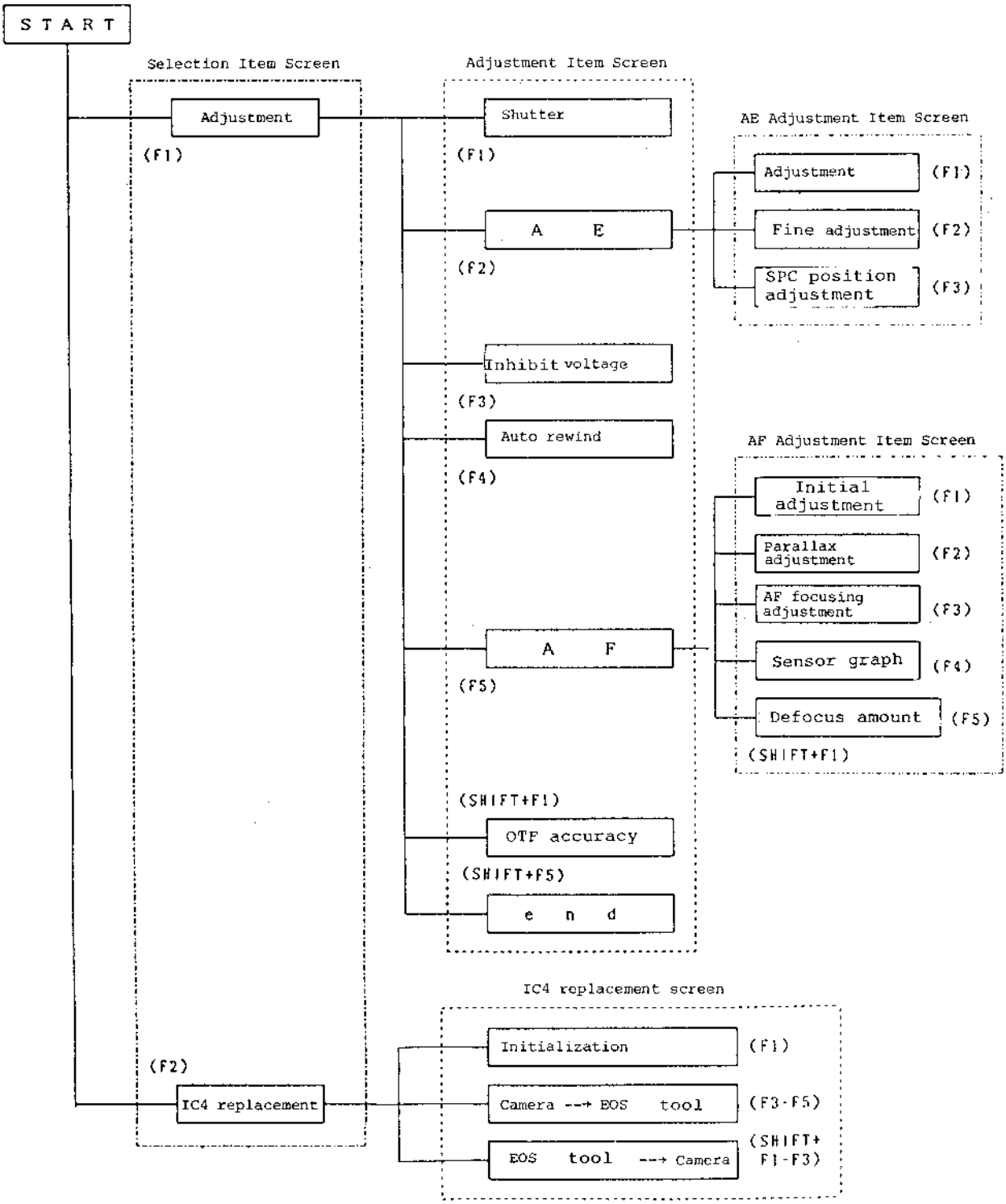
When you make a mistake, press the space key to return to the former state. (During communication, it is impossible to return to the former state.)

Additional Information

These instructions are for the improved (June, 1987) EOS Tool which uses a ROM memory card rather than a RAM memory card. For users or the earlier model we are including a list of differences between the old and new types.

| Old Type | New Type |
|---|---|
| RAM memory card mounts inside compartment. A separate card is required for each type IC4. | Interface unit mounts in the place of card and new ROM memory card is inserted into the interface slot. Only one card is required for each model. |
| The FFD alignment (F3) and AF focus adjustment (F4) were separate items. | FFD alignment is included in the AF focus adjustment (F3). Sensor Graph is not (F4) and Defocus amount (F5). |
| The unit could only hold data for 1 camera for IC4 replacement. | The new unit can hold data for three cameras for IC4 replacement. |
| Selection Items included Debug (F3) and RAM Card (F4). | These items are no longer necessary, so they have been deleted from the program. |

## 1-A EOS Tool Function Diagram




* ( ) shows function key

| Adjustment Parts Replacement | Shut-ter | AE | | | OTF accuracy | Battery check | AF | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Adjust-ment | Fine adjust-ment | SPC | | | Initial | Paral-lax | AF focus |
| IC4 (CPU) (can not be read out) | ● | ● | ▲ | | ● | ● | ● | ● | ● |
| IC4 (CPU) (can be read out) | | | | | | | | | |
| IC1 (Light measurement) | | ● | ▲ | ● | | | | | |
| IC2 (Intensity of light) | | | | | ● | | | | |
| IC3 (LCD) | | | | | | | | | |
| IC5 (IO1) | | | | | ● | ● | | | |
| IC6 (IO2) | | | | | | | ● | ● | ● |
| IC8,IC9 (Motor drive) | | | | | | | | | |
| Main flexible (can not be read out) | ● | ● | ▲ | ● | ● | ● | ● | ● | ● |
| Main flexible (can be read out) | | ● | ▲ | ● | ● | ● | | | |
| AF unit | | | | | | | ● | ● | ● |
| DC/DC converter | | | | | | | | | |
| Shutter unit | ● | | | | | | | | |
| Mirror unit | | | | | | | | ● | ● |
| | | | | | | | | | |

NOTE : o ▲ means that it is executed if necessary.
o See the "10 parts replacement" in chapter 2 on the read out of data.

2. Preliminary Operations

2.A Initializing
(after changing the battery or pressing the reset switch.)

(1) Turn the power on. The screen will be displayed except for the bottom line. Type RUN"ROM1:EOS" and press RETURN. The second screen will appear.

```
Copyright (C) 1983 by
 Microsoft & Canon
6748 Bytes free
RUN "ROM1:EOS"
```

```
DATE =  00/01/01
```

(2) Type in the date in year / month / day order using two digits for all entries. Press RETURN.

(If you make a mistake, turn off the power switch and start over.

(3) The tool will turn itself off (the display will disappear). You can now proceed.

2.B Getting started

(1) Connect the EOS tool to the camera, then turn the power on.

```
Copyright (C) 1983 by
 Microsoft & Canon
4861 Bytes free
RUN "ROM1:EOS"
```

The screen above will be displayed momentarily, then the next screen is displayed for several seconds.

```
EOS tool  (EOS650)
1987. 05. 11 ver 3.2
Copyright by Canon
```

(2) The following prompt is displayed. Confirm the connection with camera, then press the RETURN key.

```
Connect CAMERA to EOS TOOL

    then  RETURN
```

(3) After pressed the return key, the following prompt is displayed, and communication with the camera is executed automatically. When this communication is being executed correctly, the transmit (green) and receive (red) LEDs blink.

```
Communication in progress
```

R E T U R N

(4) After completing the communication, the number of films that have run through the camera is displayed on the LCD. This is an indication of haw much use the camera has had. If the memory card does not match the camera, the second prompt will be displayed instead of the first. Repair record indicates the number of repairs and classification the date (Year - Month) of the latest repair.

```
No. OF FILMS  30
SERVICE HISTORY  0
CLASS. No.  0000
IC4 TYPE  ROM 6A
```

This screen and an audible signal indicate a mismatched memory card. The power will turn off automatically after a few seconds. Replace the memory card.

```
Data cannot be sent to the CAMERA
by this MEMORY CARD!
```

(5) Press the RETURN key to display the selection item screen. When you want to do an adjustment, press the function key F1. When replacing IC-4, press the function key F2.

(Selection Item Screen)

```
 1:ADJUSTMENT
 2:REPLACEMENT

◆ADJ◆IC4◆     ◆
```

F1 ~ F2

When F1 is pressed the adjustment item screen is displayed. The bottom line shows the function key assignments by the initial three letters.

(Adjustment Item Screen)

```
 1:SHUTTER
 2:AE
 3:INHIBIT VOLTAGE
◆SHU◆AE◆INH◆AUT◆AF
```

F1 ~ F5

OR

SHIFT + F1 ~ F2

(6) The screen displays only three items in full at any one time. To see other items after the third item, press the down ▼ cursor key. To return the screen to earlier items, press the up ▲ cursor key.

```
 3:INHIBIT VOLTAGE
 4:AUTOREWIND
 5:AF
◆SHU◆AE ◆INH◆AUT◆AF
```

▲ ~ ▼

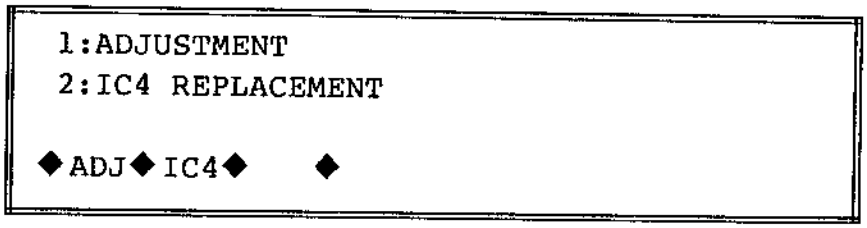
The adjustment item screen includes:

1. Shutter speed adjustment
2. AE adjustment
3. Inhibit voltage adjustment
4. Rewind adjustment
5. AF adjustment
6. OTF accuracy adjustment
9. END

To select any item, press the function key for the adjustment. For adjustments 6 and 9, press the shift key and F1 (for 6) or F4 (for 9).

NOTE: You can adjust the items in random order, but the order given is the most frequently used.

When you select IC4 replacement (F2), the prompt as shown in figure is displayed. The bottom line shows the function of the function keys. See section 10 (IC4 replacement) for the complete procedure.



3. Termination

Operation can be terminated by either of two methods.

1. By pressing the power off key.

2. By pressing SHIFT F5 (F10) "END" is selected.

The difference in these two methods is that pressing END enters the repair into the Repair History, so it should only be used when the repair is completed. To terminate the operation temporarily, say to move to another work station, the power Off key should be used.

Power should not be turned off during an actual adjustment. The adjustment item screen should be displayed when the power is turned off. If communication is in progress, or an actual adjustment is in progress, the camera will become jammed. If this happens, unscrew the grip screw and screw it back in. This activates the reset switch.

(1) Select the adjustment (F1) in the selection item screen. The adjustment item screen is displayed as follows.

(Selection Item Screen)

```
1:ADJUSTMENT
2:IC4 REPLACEMENT

◆ADJ◆IC4◆    ◆
```

(2) Press the SHIFT key, and the following prompt is displayed.

(Selection Item Screen)

```
1:SHUTTER
2:AE
3:INHIBIT VOLTAGE
◆ADJ◆   ◆   ◆   ◆end
```

SHIFT + F5

(3) Keep the SHIFT key depressing and simultaneously press the function key F5. The screen disappears and the system can be terminated.

```
Communicaton in progress
```

4. Shutter Adjustments

Tools: EOS Tool and FS-5300 Shutter Tester

PREREQUISITE: Shutter Curtain Travel Time Adjustment
Curtain travel time must be checked (and adjusted if necessary) before any shutter speed adjustments are made.

(This is a mechanical adjustment, but it is included here because this is the logical position in the adjustment order and it can only be checked after the camera is assembled.)

The curtain speeds are pre-adjusted at the factory so curtain speeds will seldom, if ever, need adjusting. If tension on the springs is inadvertently lost, see section VIII of the assembly and disassembly section.

The first curtain adjustment screw is accessible by removing the battery case and the blind cover shown in section IV. 3 of the disassembly section, but the second curtain adjustment screw cannot be reached unless the shutter unit is out of the body. When the shutter unit is out of the body, curtain speed cannot be checked.

| Standard: | 650 | 620 |
|---|---|---|
| Both Curtains: | 5.1 $\pm$ 0.2ms | 2.6 $\pm$ 0.2ms |

SHUTTER SPEED ADJUSTMENTS

Adjustment is made at the maximum shutter speed.

EOS 650 = 1/2000 EOS 620 1/4000

Adjustments are easier if the camera is set to the shutter priority mode and single frame (S) film advance.

CAUTION!During adjustment procedures, the shutter speed may accidentally reset to 1/125. During adjustments check the indication to insure the maximum speed is set.

(1) Press the F1 key of the adjustment item screen. The following prompt is displayed.

(Adjustment Item Screen)

```
 1:ADJUSTMENT
 2:AE
 3:INHIBIT VOLTAGE
◆SHU◆AE ◆INH◆AUT◆AF
```

F1

```
Check SHUTTER SPEED
 then press 'RETURN'
```

R E T U R N

(2) Set the camera as follows:

MODE ---------- Shutter priority

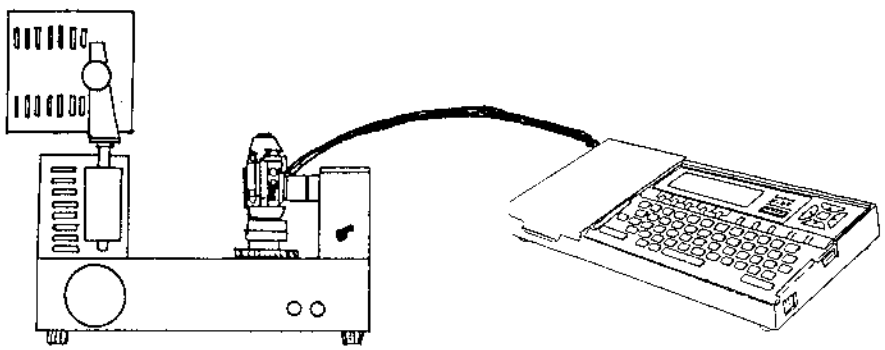
Shutter speed --- maximum

Winding mode --- S.

(3) Release the shutter and check the shutter speed (B line) several times (about 10 times is ideal) using the shutter tester.

| | Standard: | (Limits) |
|---|---|---|
| EOS 650 (1/2000): | 0.488 ms. | (0.370 - 0.644 ms.) |
| EOS 620 (1/4000): | 0.244 ms. | (0.185 - 0.322 ms.) |

(4) Average the results.

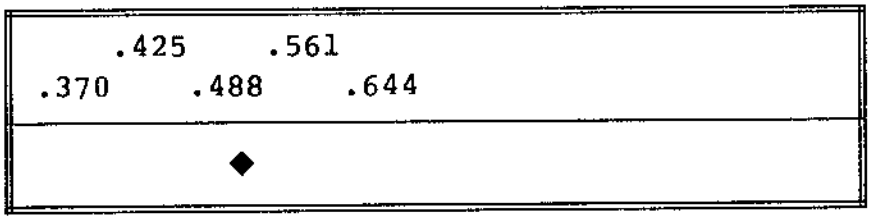


Shutter tester

(5) After completed the measurement, press the RETURN key.

(6) The following prompt is displayed.

(Screen when using EOS 650)

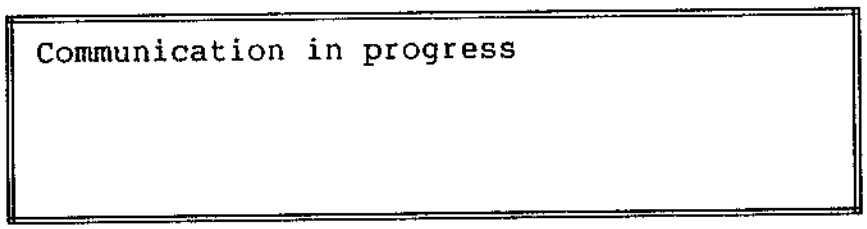



◀ ~ ▶
After selected.
R E T U R N

(7) Using the cursor keys, set the cursor below the average value determined above. One step is 0.05EV, or about 0.02ms in the 650 and about 0.01ms in the 620.

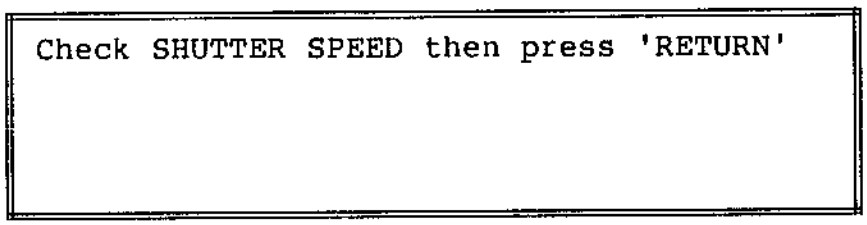
For example, if the average measured by the shutter tester is 0.561ms, position the cursor under .561 using the cursor key. If the average measured is off the scale on the screen, set the cursor to the closest number.

(8) After setting the cursor, press the RETURN key to transmit to the camera.




(9) After the transmission is complete, the following prompt is displayed. Check the shutter speed indication to it is still on the maximum (it may reset to 1/125 after transmission), and then recheck the shutter speed.

Note: If the speed is still far out of limits, the screen indicated below (6) will reappear.




R E T U R N

(10) After checking the speed, press the RETURN key. The following prompt is displayed.

```
OK? press 'RETURN
NG? Press 'Space Bar
```

OK: RETURN

NG: SPACE

(11) If OK, press the RETURN key, or if NG (no good), press the space bar.

(12) When the RETURN key is pressed, the screen returns to the adjustment item screen.

(Adjustment Item Screen)

```
 1:SHUTTER
 2:AE
 3:INHIBIT VOLTAGE
◆SHU◆AE ◆INH◆AUT◆AF
```

(13) If the space bar is pressed, shutter speeds screen reappears.

4-A X sync time lag check (Not adjustable)

Connect the hotshoe adaptor and set to shutter priority or manual.

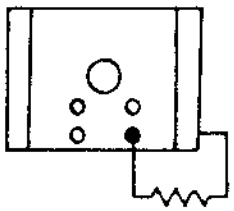
| X Sync Shutter speed | | A Value (ms) | B value (ms) |
|---|---|---|---|
| EOS 650 | 1/125 | 0.32 or over | 0.19 or over |
| EOS 620 | 1/250 | 1.92 or over | 1.5 or over |

(If out of tolerance, change shutter unit.)

4-B AE - Flash Changeover (Not adjustable)

Install one of the dedicated speedlites (420EZ, 300EZ, or 300TL), and check that the speed changes to the X sync speed when the ready lamp lights.

If a speedlite is not available, install a 4.7K resistor from the TV terminal to ground.



4.7 k Ω

5. AE Adjustment

The AE adjustment includes the following items:

SPC position adjustment: Adjusts IC1 position

Adjustment: Level, gain and offset adjustments.

Fine adjustment: Level adjustment.

(1) Press the function key F2 to display the AE adjustment item screen. The bottom line shows the function key assignments by the first three letters.

(Adjustment Item Screen)

```
 1:SHUTTER
 2:AE
 3:INHIBIT VOLTAGE
◆SHU◆AE ◆INH◆AUT◆AF
```

F2

(AE Adjustment Item Screen)

```
 1:ADJUSTMENT
 2:FINE ADJUSTMENT
 3:SPC POSITION
◆ADJ◆FIN◆SPC◆    ◆
```

F1 ~ F3

Press the function key of the item you wish to adjust. (The number keys can be used instead of the function keys.) If you make a mistake, press the space bar. This returns the screen to the adjustment item screen.

Adjustment Order:

The programming of the EOS Tool is such that the screen order is 1. Adjustment, 2. Fine Adjustment, and 3. SPC Position. This book is also laid out in this order. Actually, SPC position must be correct before doing the other adjustments.

Therefore, do item 3 (section 5-C) first, and then return to 5-1.

5-A Adjustment

This is the main exposure level adjustment. The "offset", "level", and "gain" adjustments that have been necessary on previous models are accomplished by this single adjustment in the EOS camera. This adjustment is mandatory when either the SPC or IC4 has been changed.

PREREQUISITE: SPC position adjustment (5-C) and Shutter adjustment(4)

TOOLS:

EV Tester (EF-500)

EV9 : 64.0 nit

EV15: 4096 nit (+0.5EV is the proper reading for correct exposure -- See the mechanical Repair Guide for further details.)

(1) Press the function key F1 in the AE adjustment item screen to display the screen shown below.

(AE Adjustment Item Screen)

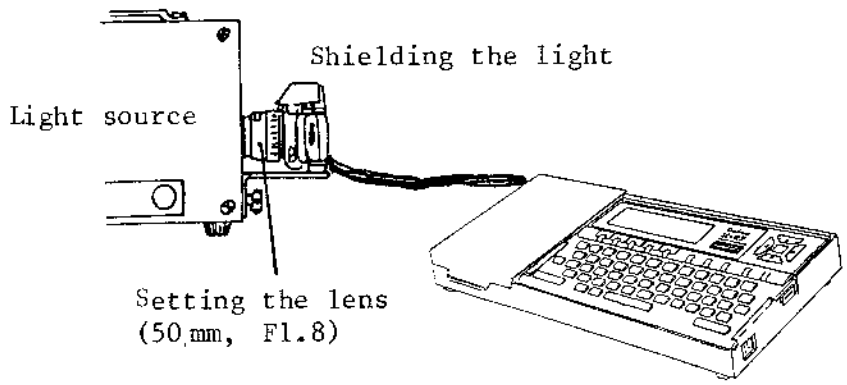
```
 1:ADJUSTMENT
 2:FINE ADJUSTMENT
 3:SPC POSITION
◆ADJ◆FIN◆SPC◆    ◆
```

F1

```
Set tester to EV=9
 then 'RETURN'
```

RETURN

When selected incorrectly: SPACE



(2) Set the EV Tester to EV9, and the lens to infinity. The EV tester light curtain should be used to reduce the influence of ambient light.

Press the RETURN key.

```
Communication in progress
```

(3) Press the RETURN key to display the next screen. Set the tester to EV15, and press the return key again.

```
Set tester to EV = 15 then 'RETURN'
```

R E T U R N

(4) The screen displayed below should appear.

```
Check AE accuracy then 'RETURN'
```

R E T U R N

Check the exposure.

EV9 & EV12 : 0 ± 0.5EV

EV15 : +0.5 ± 0.5EV

(5) After confirming the exposure, press the RETURN key to display the screen shown below.

```
OK? press 'RETURN'
NG? Press 'Space Bar'
```

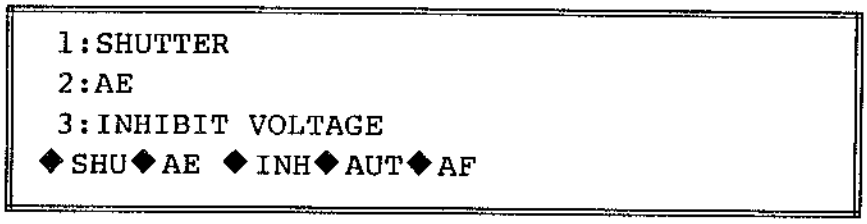
OK: RETURN

NG: SPACE

(6) If OK press the RETURN key. If NG press the space bar.

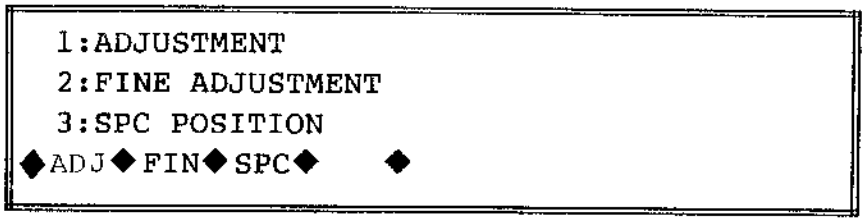
(7) When you press the RETURN key, the adjustment item screen returns.

(Adjustment Item Screen)




(8) When you press the space bar, the AE adjustment item screen returns.

(AE Adjustment Item Screen)



5-B Biasing exposure to customers preference

This adjustment can be used to adjust the center value, or zero point, of automatic exposure to the user's preference. For example, if a customer complains that his camera consistently overexposes by ½ f-stop, but test show it is properly adjusted, you can set it to consistently underexpose by ½ f-stop. This should give the uses the exposure he prefers.

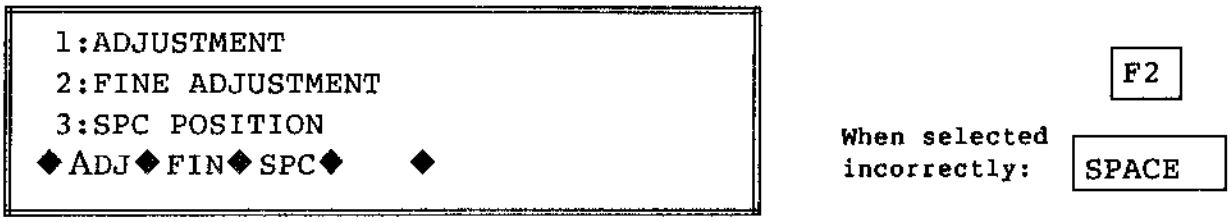
This is called "Fine Adjustment" on the EOS Tool.

PREREQUISITES: SPC Position adjustment (Confirmation only)
AE Adjustment

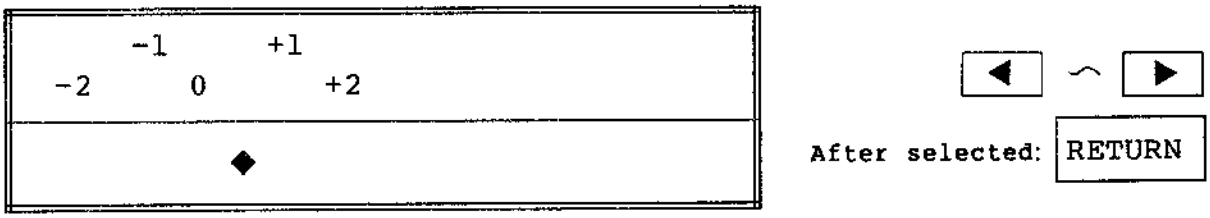
TOOLS: AE tester (EF-500)
EOS lens (50mm/1.8)

(1) Press the function key F2 in the AE adjustment item screen to display the screen as below.

(AE Adjustment Item Screen)




(Screen when using EOS 650)

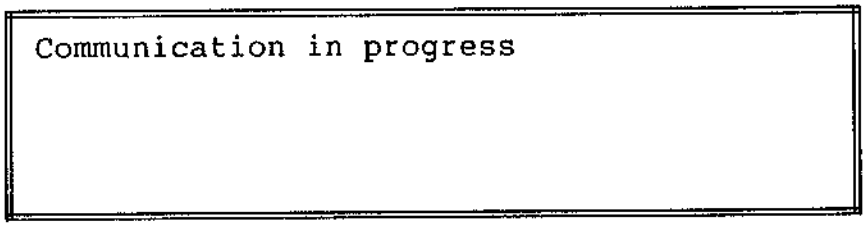



(2) Move the cursor, with the lateral cursor keys, to the amount of correction desired. Each step is 0.25EV.

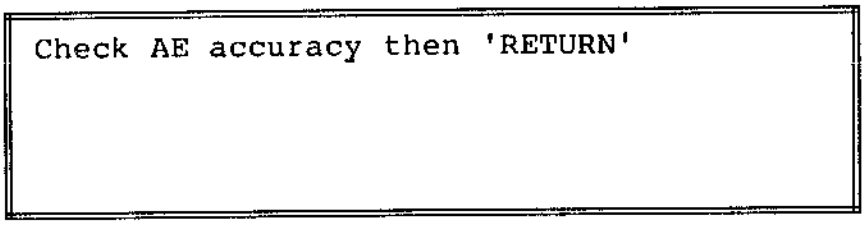
For example, if you wish to set -1EV underexposure, move the cursor four steps to the left so it is under the -1 on the scale.

NOTE: If it is necessary to set to a value greater than ± 2EV, see the note on the next page.

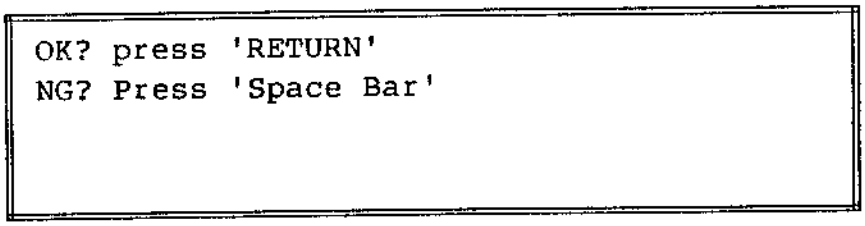
(3) Press the RETURN key. The screen shown below is displayed the data is read into the camera.



(4) After the data is read into the camera this screen is displayed. Recheck AE accuracy. It should not read "0EV". It should read the amount of correction you have entered.




(5) Press the RETURN key to display the next screen.

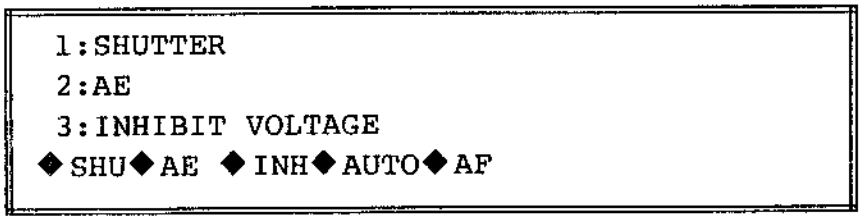



(6) If OK, press the RETURN key. If NG, press the space bar.

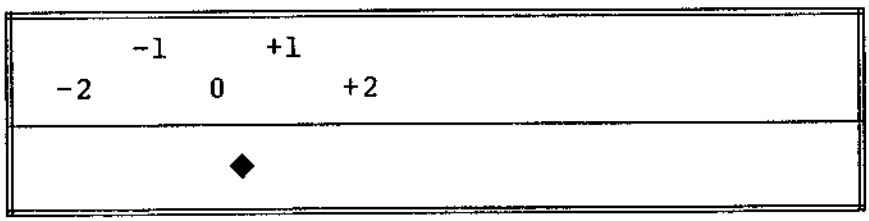
Note: If a correction greater than ± 2EV, for instance +3EV, is required, first set the cursor under +2 and press the return key. Then in step (6), press the space bar and input the +1EV for a total of +3EV.

(7) When you press the RETURN key, the adjustment item screen returns.

(Adjustment Item Screen)




8) If you press the space bar, the ± EV screen returns for further adjustment.



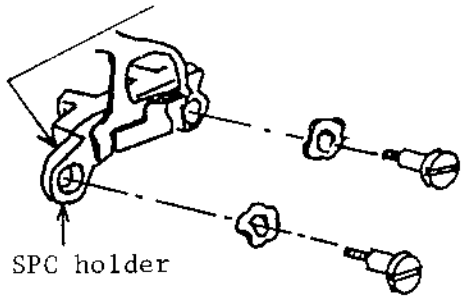
5-C SPC position adjustment

If the position of IC1, which contains the AE photosensor (SPC), is disturbed, it must be repositioned.

PREREQUISITES: None

TOOLS:

AE tester (EF-500)
EOS lens (50mm/1.8)
Adjusting mask (local fabrication)




Preparation:

Clean the old adhesive from both the AE sensor box and the pentaprism box with a knife or sandpaper.

Install the SPC holder as shown with the shoulder screws and wave washers. The screws and washers are designed to hold the box firmly, but still allow adjustment. After completing the adjustment, bond the sensor box to the pentaprism box with instant bond (Aron Alpha).

Set-up:

(1) Set the mask (see the tools list for dimensions) in front of the light source on the EV tester. Set the tester to EV15.

Set the lens to manual focusing and minimum distance (45cm). Aim the camera so the center hole is centered in the viewfinder (Fig. 1).

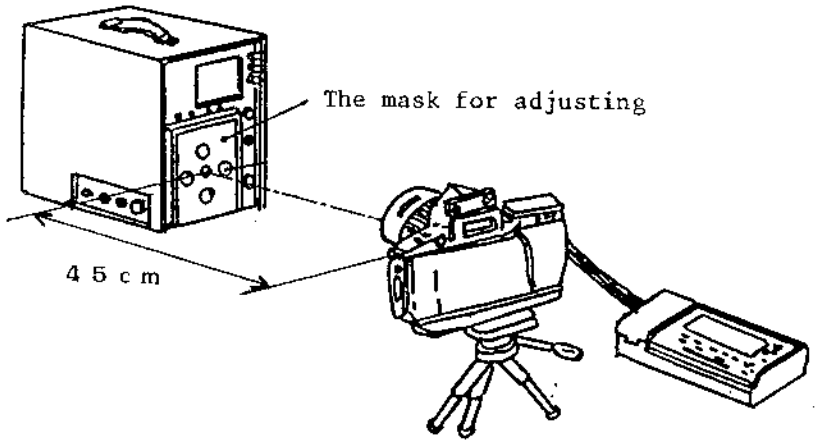



Fig. 1

Adjustment:

(1) Display the AE adjustment item screen. Press function key F3. The screen as below is displayed.

(AE Adjustment Item Screen)

```
 1:ADJUSTMENT
 2:FINE ADJUSTMENT
 3:SPC POSITION
◆ADJ◆FIN◆SPC◆    ◆
```

F3

```
Communication in progress
```

(2) After communication is complete, this screen will be displayed. The indications on the screen are the approximate light values for the six areas of the SPC (Fig. 2).

```
13.9                  14.0
      14.0    [13.9]
13.9                  14.0
```

(3) Cover the SPC or darken the room. Shield four of the five holes (including the center hole), and read the SPC center reading (the one in brackets [] on the LCD display. Do this for all four outer holes.

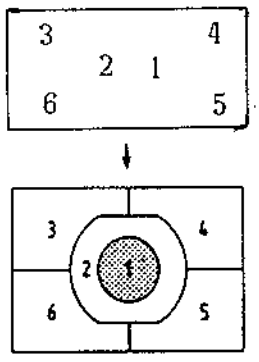



Fig. 2

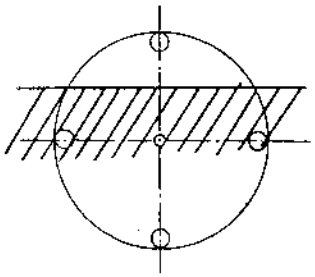
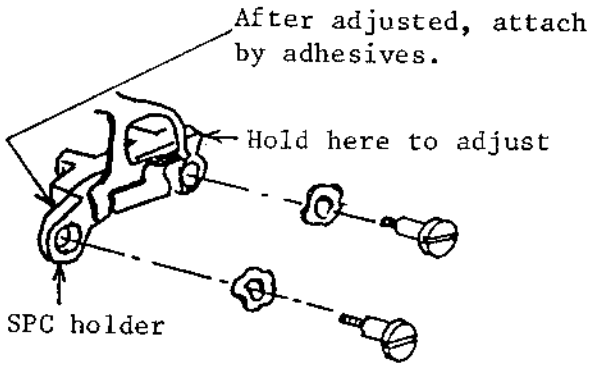


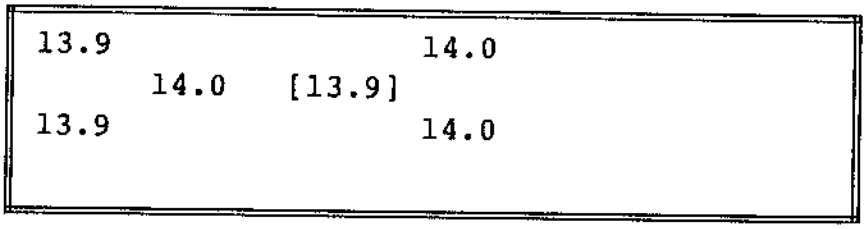
Fig. 3

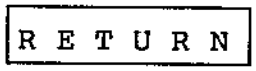
Adjust the SPC holder so all four readings are within two EV. Hold the protruding edge of the holder and adjust in very small increments. (The EV values will not be the same because the metering pattern is not symmetric.)



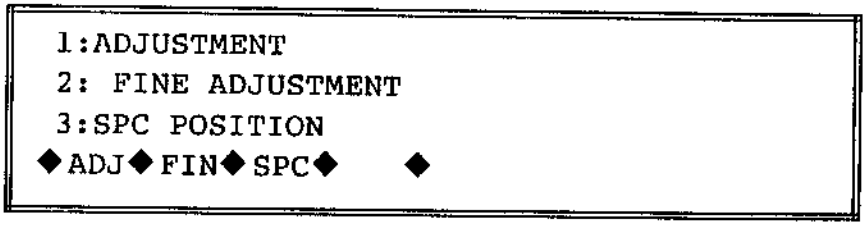

(4) After completing the adjustment, apply instant bond between the SPC sensor box and the pentaprism box.

(5) Press the RETURN key to return to the AE adjustment item screen.




(Adjustment Item Screen)




(6) Install the top cover and recheck again as in step (3).

6. Inhibit Voltage Adjustment

The inhibit voltage is the lowers operating voltage. If the voltage drops below the inhibit voltage, the camera will not operate. If it is set too high, useful battery energy will be wasted. If it is set too low proper operation of the camera cannot be guaranteed.

PREREQUISITES: None

TOOLS: DC constant voltage power supply (LVPS)
Digital Multimeter
Dummy battery
0.83 ohm 2W Resistor

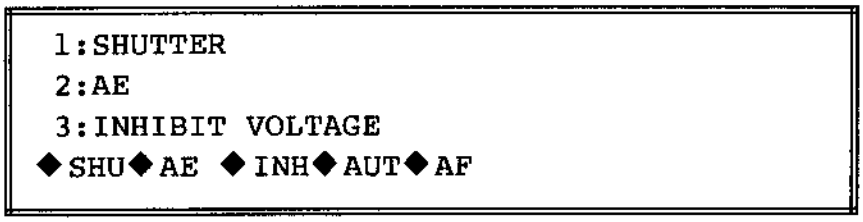
PRECAUTIONS:

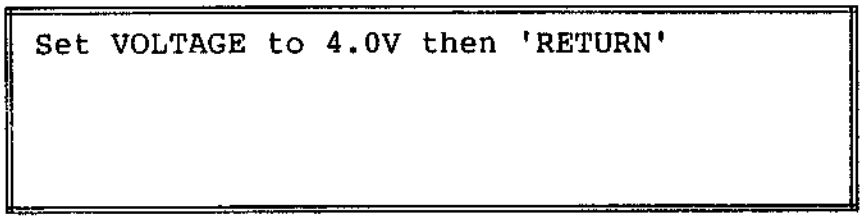
Set the inhibit voltage precisely at 4.0 volts. If too high, useful battery life will be shortened.

ADJUSTMENTS:

(1) Press function key F3 in the adjustment item screen. The lower screen will be displayed.

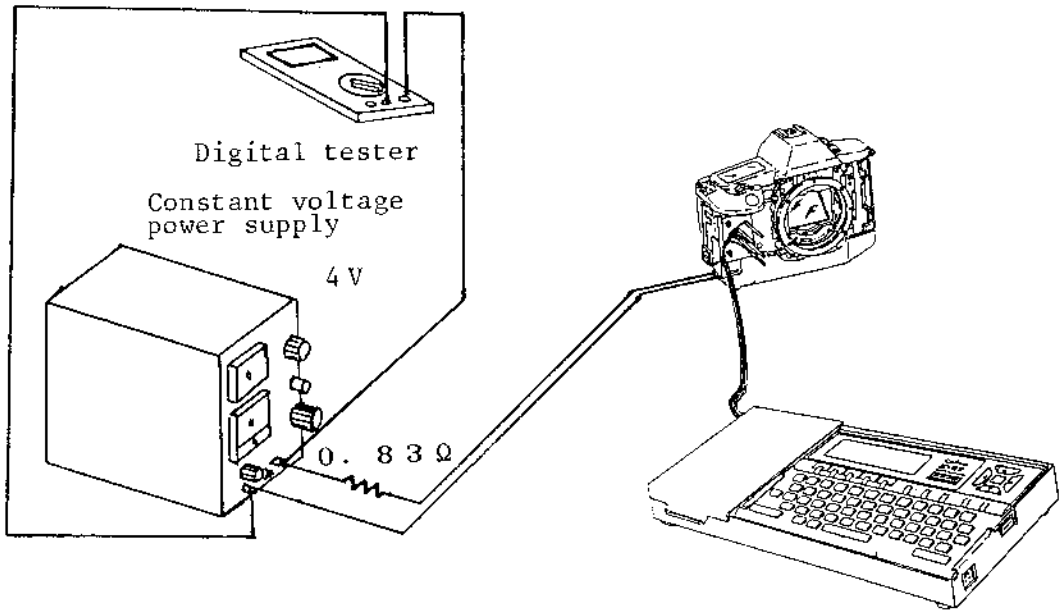
(Adjustment Item Screen)




When selected incorrectly: RETURN / SPACE

(2) Connect the power supply as indicated.




(3) Set the LVPS to 4.0 volts precisely and turn the power on. Press the RETURN key.

(4) When the RETURN key is pressed, communication with the camera takes place and the sound of Mg-1 operating is heard.

```
Communication in progress
```

(5) After the communication is completed, this prompt appears.

```
Check INHIBIT VOLTAGE
 then 'RETURN'
```

After confirmed.

R E T U R N

Check the inhibit voltage as follows:

1) While continuing to release the shutter, slowly reduce the power supply voltage from about 4.5V. Read the voltage where the camera stops operating is 3.9 V. Limit: (3.9 to 4.1V)

2) Slowly raise the voltage from 3.5V. Confirm that the shutter can be released at 4.1V.

(6) Press the RETURN key to display the next screen.

```
OK? press 'RETURN'
NG? Press 'Space Bar'
```

OK: RETURN

NG: SPACE

(7) If OK, press the RETURN key, or if NG, press the space key.

(8) When the RETURN key is pressed, the adjustment item screen appears.

(Adjustment Item Screen)

```
 1:SHUTTER
 2:AE
 3:INHIBIT VOLTAGE
◆SHU◆AE ◆INH◆AUT◆AF
```

(9) If the space key is pressed, the inhibit voltage screen reappears and you must adjust again.

```
Set VOLTAGE to 4.0 V then 'RETURN'
```

(10) As a final check, press the battery check button.

| | |
|---|---|
| 5.6V or over | --- --- --- |
| 5.2 - 5.6V | --- --- |
| 4.8 - 5.2V | --- |
| Under 4.8V | No indication |

7. Rewind adjustments (User Preference Adjustments)

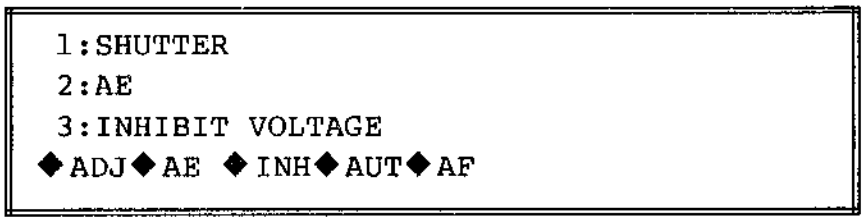
In both cameras automatic rewind can be disabled at the user's request, and the leader can be stopped before it is drawn completely into the cartridge in the EOS 620.

PREREQUISITES: None

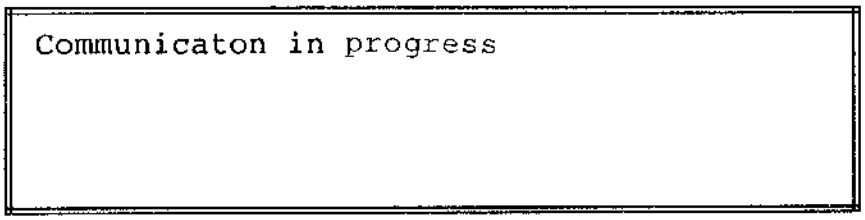
TOOLS: A roll of film ( It need not be new, and a 12 exposure roll saves time.)

(1) Press function key F4 in the adjustment item screen to display the rewind screen.

(Adjustment Item Screen)



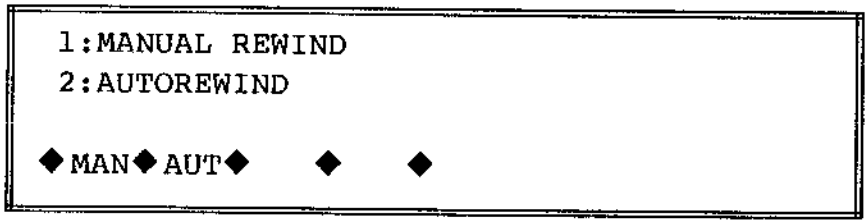

F4




(2) After completed communication, the rewind adjustment item screen is displayed.The screen is different for each model.

EOS 650 SCREEN

(Adjustment Item Screen)



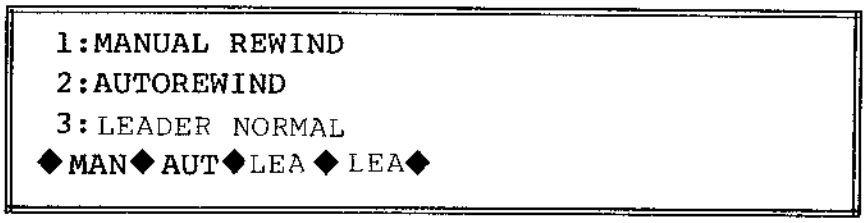

F1 ~ F2

(3) Function keys (EOS 650)

F1 Autorewind suppression

F2 Normal autorewind

EOS 620 SCREEN




(3) Function keys (EOS 620)

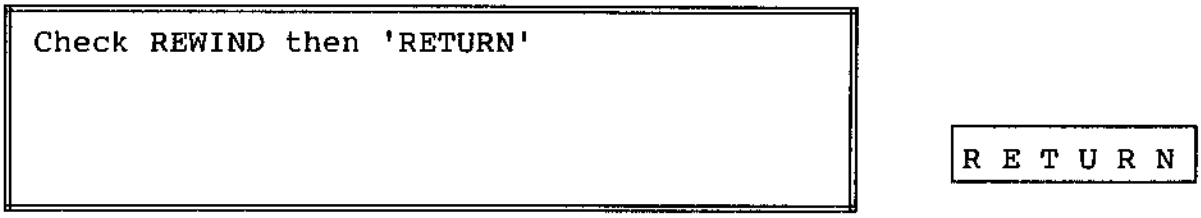
F1 Autorewind suppression

F2 Normal autorewind

F3 Normal leader (wound completely into cartridge)

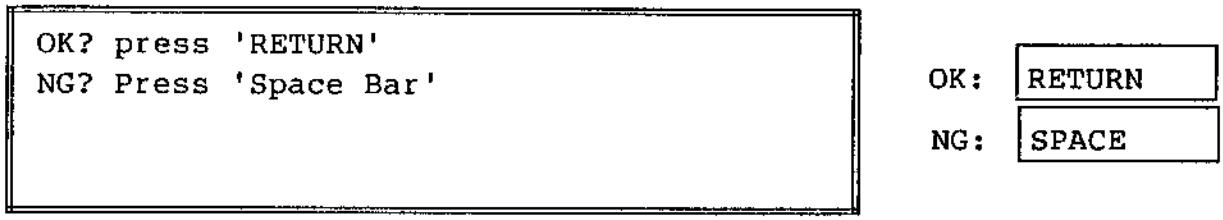
F4 Leader protruding

(4) Press the function key to display the screen below, then check rewind.




To check, transport the film to the end and check whether rewind starts automatically or not.

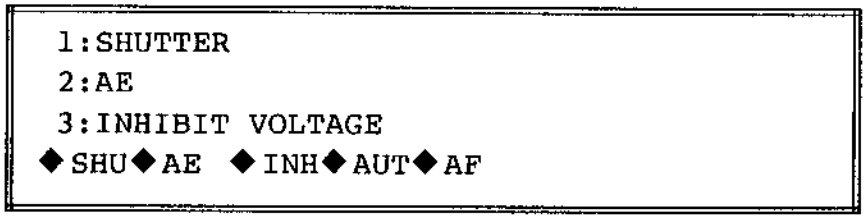
(5) Press the RETURN key to display the next screen.



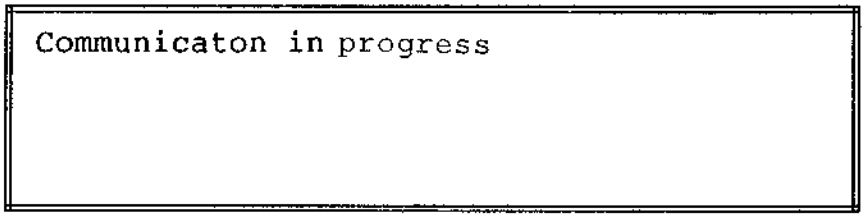

(6) If OK, press the RETURN key. If not, or if you need to do the second adjustment for the 620, press the space key.

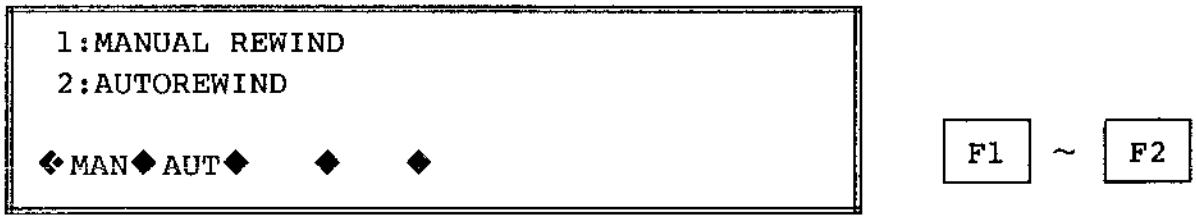
(7) When press the RETURN key, the adjustment item screen reappears.

(Adjustment Item Screen)




(8) If you press the space key, the "communication" first appears and the the rewind adjustment item screen reappears.



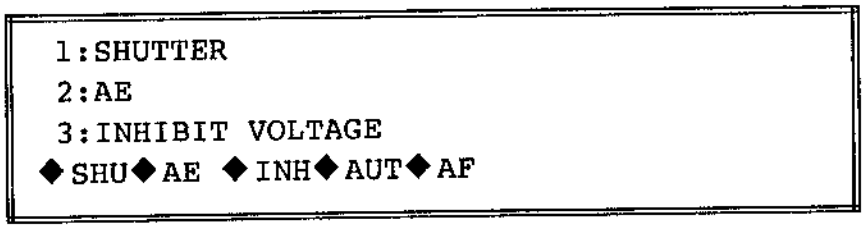
8. AF adjustment

Autofocus (AF) adjustment consist of the following adjustments.

| Adj. No. | Name | Item No. | Object |
|---|---|---|---|
| 8-A | Initial adjustment | 1 | Dark current, AGC, and sensor balance |
| 8-B | Parallax | 2 | Sensor - viewfinder parallax adjustment |
| 8-C | AF focus adjustment | 3 | Adjust focus (including FFD input) |
| 8-D | Sensor graph output | 4 | Used to insure even lighting of the charts |
| 8-E | Defocus output | 6 | Overall check of AF adjustments |

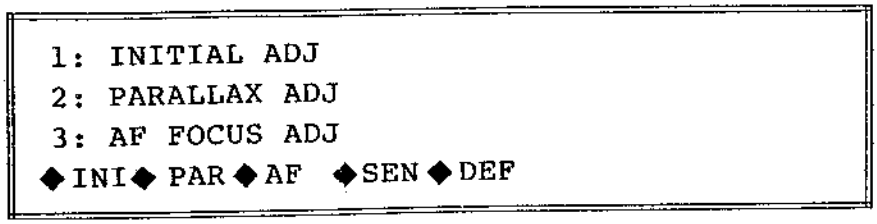
(1) Press function key F5 in the adjustment item screen to display the AF adjustment item screen.

(Adjustment Item Screen)




F5

(AF Adjustment Item Screen)




F1

If selected incorrectly: SPACE

Any adjustment can be accessed by pressing the appropriate function key or number key. Adjustment # 8-D is used to adjust the lighting on the chart surface. Since even lighting on the chart surface is required for most of the adjustments, it is a prerequisite for most of the other adjustments, but if your test set-up is stable, it need not be checked every time.

Adjustment Order:

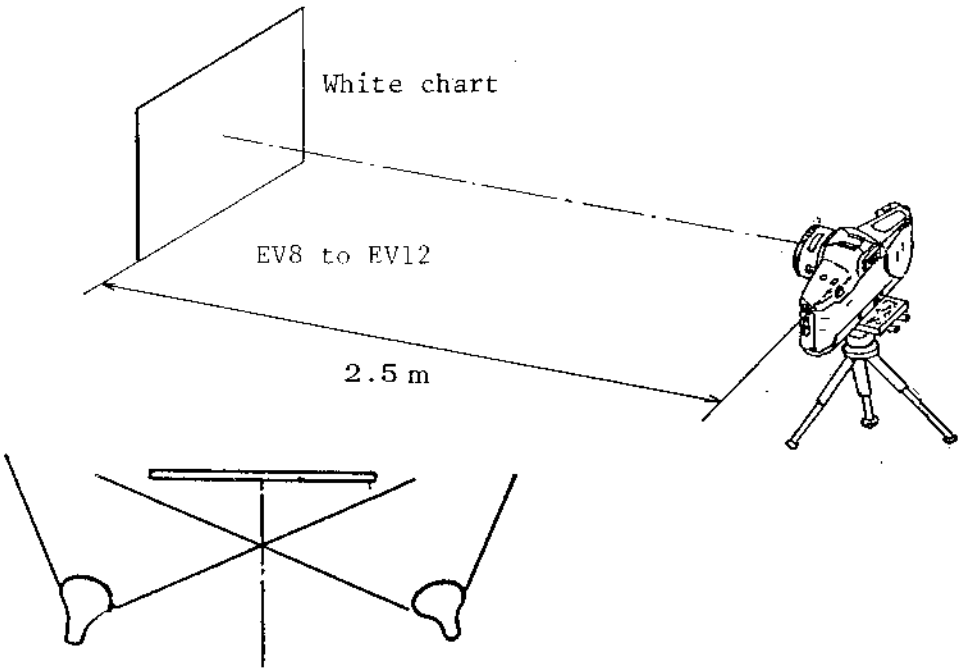
If the AF unit is replaced, do adjustments 8-A through 8-D in order.

If no parts have been replaced and autofocus is being checked in response to a customer claim, start with 8-G, AF Precision Check, and then proceed to any necessary adjustment.

Chart Illumination

Chart illumination, for all adjustments that use charts, must be even over the area of the chart and exceed EV8. (EV8 to EV12 is best). 45° lighting from both sides with tungsten or quartz lighting (no fluorscent lights) works best, but a single strong light (about 500W) can be used if it provides even illumination.

Adjust the balance on the chart surface by referring to section 8-D (sensor graph output).



8-A Initial adjustment

This adjustment sets dark current compensation, AGC, and compensates for optically and electronically caused bit-to-bit variations of the "BASIS" sensor.

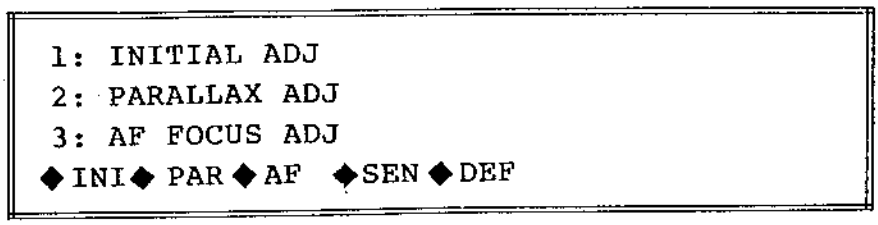
PREREQUISITES: AF Sensor Positioning (Mechanical Repair Guide, section III-6)

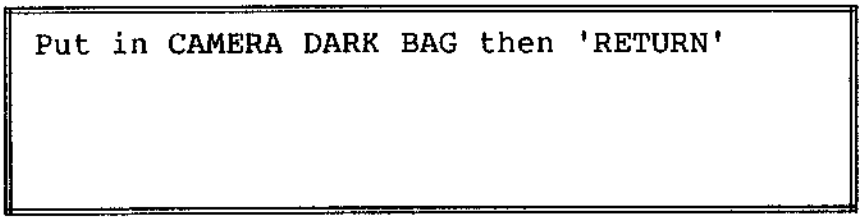
TOOLS: EV Tester (EF-500) (light source only)
Changing (Dark) bag

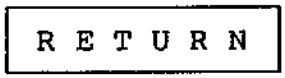
Precautions: Do not mount a lens.
Make sure the main and sub mirrors, and the AF sensor surface are clean.

(1) Press function key F1 of the AF adjustment item screen to display the screen shown below.

(AF Adjustment Item Screen)

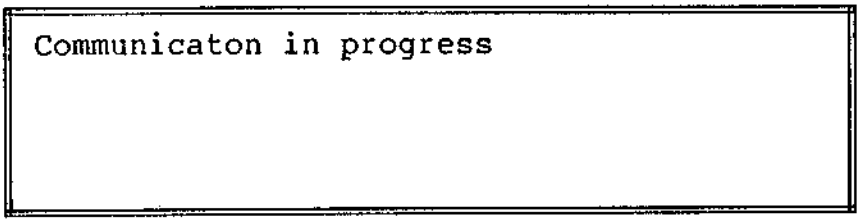





(2) Put the camera into the changing bag to insure a brightness of less than EV -1. (The camera cannot be made light-tight with the front cover removed.

(3) Press the RETURN key.

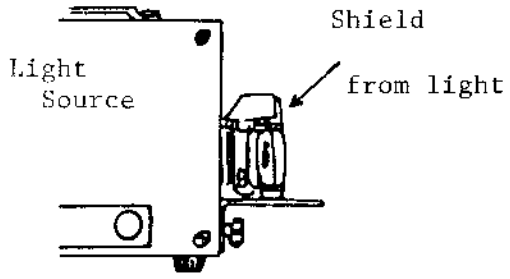


(4) After the communication is completed, the next screen will be displayed. Remove the camera from the changing bag and set it against the light source screen. Set the light source to EV15, and press the RETURN key.

NOTE: Shield to reduce the influence of ambient light.

```
Set tester to EV = 15 then 'RETURN'
```

R E T U R N




(5) When the RETURN key is pressed communication with the camera will start.

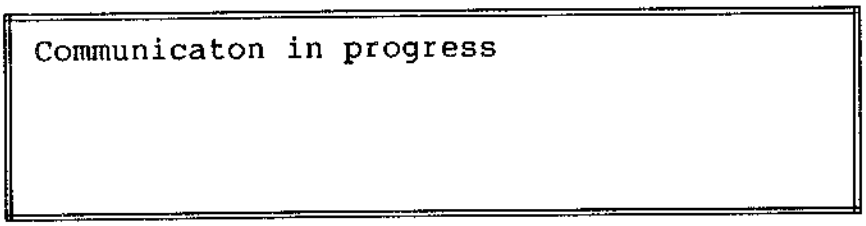
```
Communicaton in progress
```

(6) Next, this screen is displayed. Set the light source to EV9 and press the RETURN key.

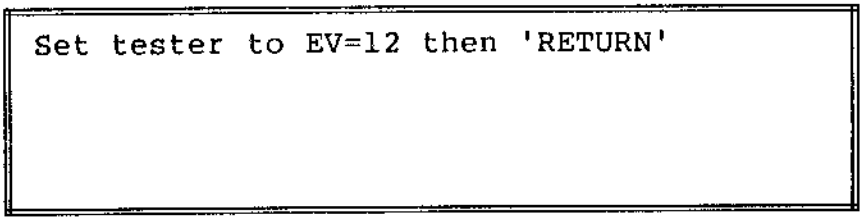
```
Set tester to EV=9 then 'RETURN'
```

R E T U R N

(7) When the RETURN key is pressed communication with the camera will start, and continue for about ten seconds.

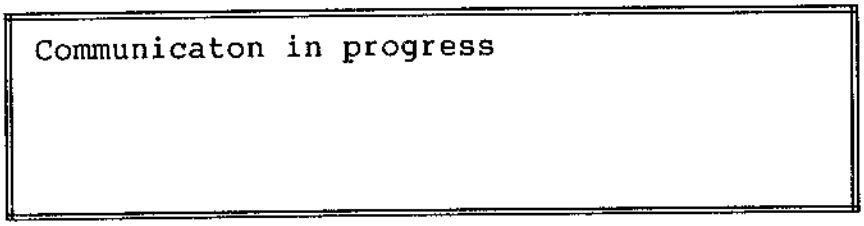



(8) After the communication is completed, the next screen will be displayed. Set the light source to EV12, and press the RETURN key.



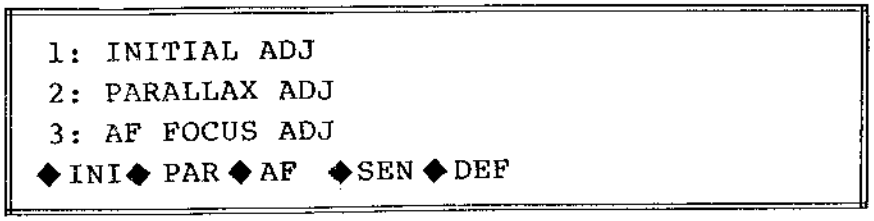

R E T U R N

(9) Again the data is transferred to the camera.




(10) After this communication is completed the initial adjustment is complete and the AF adjustment item screen returns automatically.

(AF Adjustment Item Screen)



8-B Parallax adjustment

This adjustment aligns the AF sensor to the rangefinder frame in the viewfinder.

PREREQUISITES: AF initial adjustment

TOOLS:
Parallax (4.2mm single bar) chart
AF Standard Tool Lens
90% White Chart (copy paper OK)
Chart Illumination (Tungsten or quartz lamp)
Tool Focusing Screen
Tripod

Precaution:

Balance the illumination on the chart. See section 8-E, Sensor graph output" for future details.

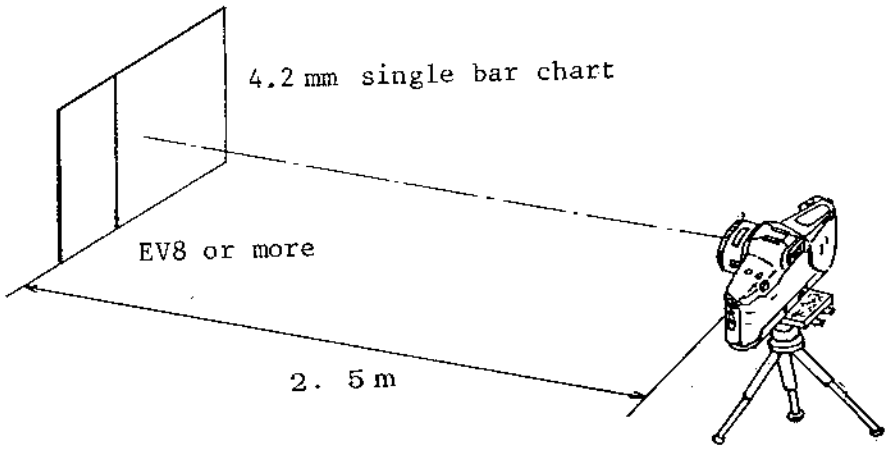
Set-up:

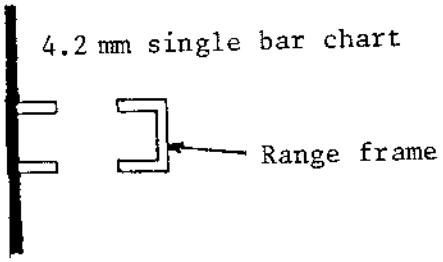
(1) Install the tool focusing screen in the camera.

(2) Illuminate the chart in accordance with section 8-E.

(3) Set the parallax (One bar chart).

(4) Set the camera 2.5 meters from the chart and align the left edge of the rangefinder frame on the chart's bar.

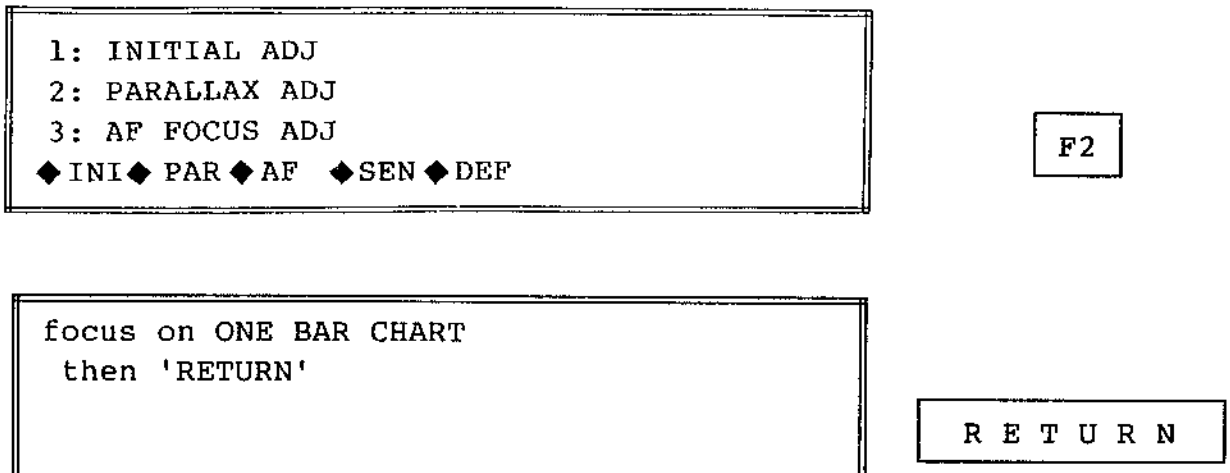


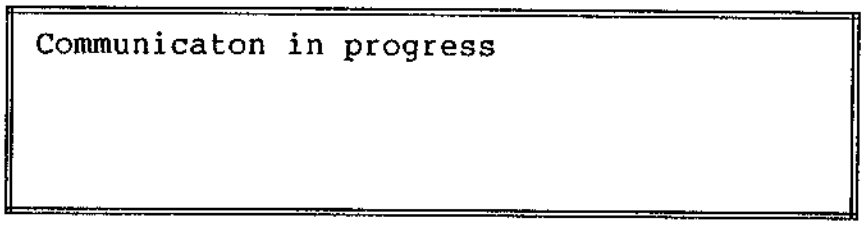
Adjustment:

(1) Press function key F2 of the AF adjustment item screen to display the parallax adjustment screen as shown below.

(AF Adjustment Item Screen)

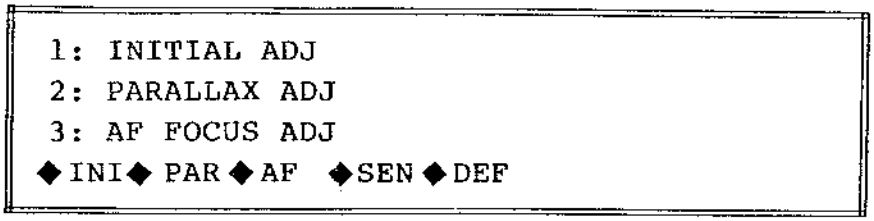



(2) Check that the camera is aligned with the chart as shown in the set-up, and press the RETURN key.Communication will begin.




(3) When this communication is completed the parallax adjustment is complete and the AF adjustment item screen returns automatically.

(AF Adjustment Item Screen)



8-C AF Focus Adjustment

1. FFD input

This step inputs the actual measured FFD (see mechanical adjustments) into the camera's computer to be used in subsequent adjustments.

PREREQUISITES: None

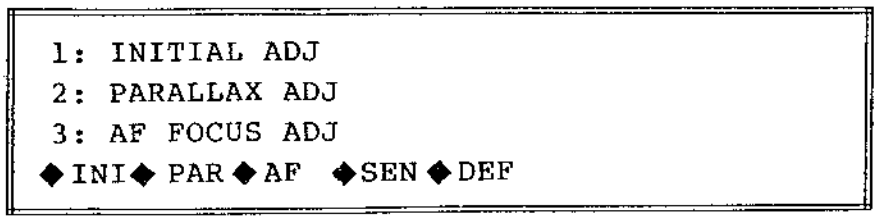
Tools: 44.14mm gauge (See mechanical adjustments)

Precaution: This data input is a prerequisite for the AF focus adjustment.

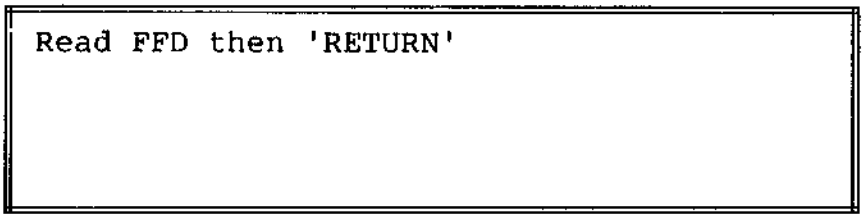
Procedure:

(1) Press function key F3 of the AF adjustment item screen to display the "AF Focus Adjustment" screen.

(Selection Item Screen)




F3

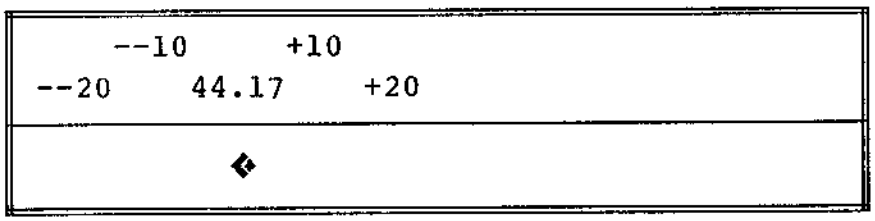



After completed measurement.

R E T U R N

(2) Take the actual measured center FFD value (measured from the pressure plate) from the mechanical adjustment data. Subtract 44.17 from the measured value. The answer should be 0 ± 20um. If it is greater, the mechanical FFD adjustment must be readjusted.

(3) Press the RETURN key. The screen shown below will be displayed. By using the cursor key, move the cursor to the answer in (2). (One step is 2.5um. After setting the cursor, press the RETURN key.




◀ ⌒ ▶

After selected.

R E T U R N

(4) The data is input to the camera.

| Communicaton in progress |
|---|

(5) This completes the FFD data input. The screen changes automatically to this chart and the tool is set for the AF focus adjustment.

| focus on Std. CHART then 'RETURN' |
|---|

After set.

| R E T U R N |
|---|

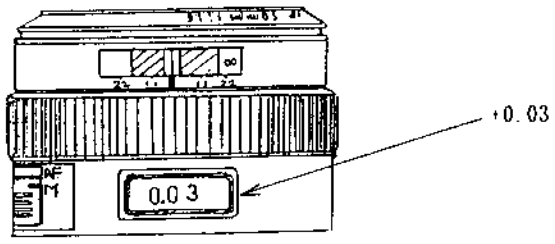
2. AF focus adjustment

The purpose of the AF focus adjustment is to match the AF sensor focus with the film focus.

PREREQUISITES: AF initial adjustment
Parallax adjustment.
FFD data input

TOOLS:
AF Standard Chart
AF Standard Tool Lens
90% White Chart
(Copy Paper OK)
Illumination
(Tungsten or quartz lamps)
Tool Focusing Screen
Tripod

AF Standard Tool Lens




Precaution: Balance the illumination on the chart. See section 8-D, Sensor graph output" for future details.

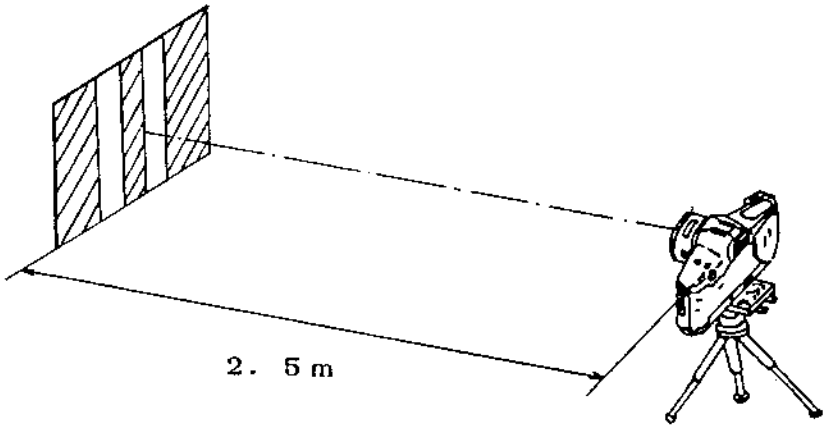
Set-up:

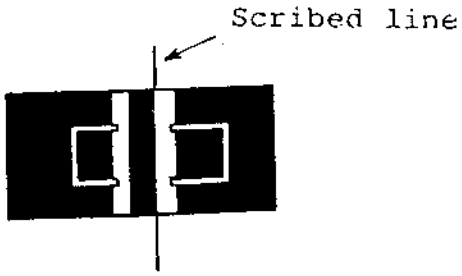
(1) Install the tool focusing screen in the camera.

(2) Illuminate the chart in accordance with section 8-D.

(3) Set the AF Standard chart.

(4) Set the camera 2.5 meters from the chart and align the rangefinder frame on the chart as shown.




(5) Read the back focus variation label on the tool lens. If it is marked other than zero "0", both adjustments 1 and 2 are necessary. If the tool lens has zero variation, only adjustment 1 is necessary.

(6) The screen should be the same as at the finish of the FFD input.

```
focus on Std. CHART then 'RETURN'
```

After set.

R E T U R N

(7) Check that the rangefinder mark is aligned on the chart as shown in the set-up.

ADJUSTMENT 1

(1) On the EF tool standard lens, move the focusing ring to infinity and then return it to the reference mark on the focusing scale.

Note: It is necessary to go from infinity to the reference mark to eliminate any backlash error.

(2) Press the RETURN key; communication with the camera will be executed.

```
Communicaton in progress
```

(3) When communication is complete, the AF focus adjustment is complete. The screen returns automatically to the AF adjustment item screen.

(AF Adjustment Item Screen)

```
1: INITIAL ADJ
2: PARALLAX ADJ
3: AF FOCUS ADJ
◆INI◆ PAR◆AF  ◆SEN◆DEF
```

ADJUSTMENT 2

(This adjustment is not necesary for AF Standard Tool Lenses with "0" variation.)

(1) Call up the Defocus Amount screen by pressing F5 from the AF Adjustment Screen. Communication with the camera will be executed.

(AF Adjustment Item Screen)

```
1: INITIAL ADJ
2: PARALLAX ADJ
3: AF FOCUS ADJ
◆INI◆ PAR◆AF  ◆SEN◆DEF
```

F5

```
Communicaton in progress
```

(2) When communication is completed, the screen will go blank temporarily and the the present defocus will appear. If the lens is in focus, as it should be, "0" will appear.

```
DEFOCUS = 0
```

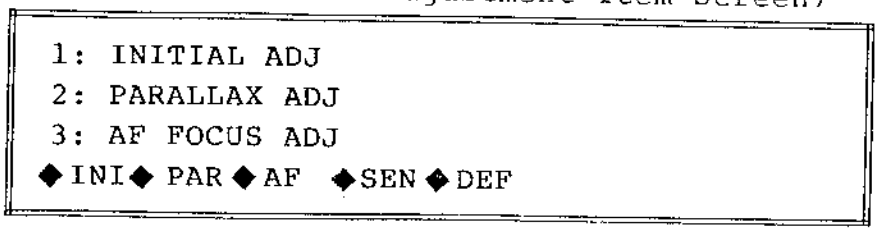
Turn the focusing ring to infinity and then back slowly toward the 2.5 meter index. Turn it back until the negative of the variation appears as the defocus amount (In our example, this would be -0.03). If you overshoot the amount go completely back to infinity and try again.

Example: Variation = + 0.03; Set to - 0.03.
Variation = - 0.05; Set to + 0.05.

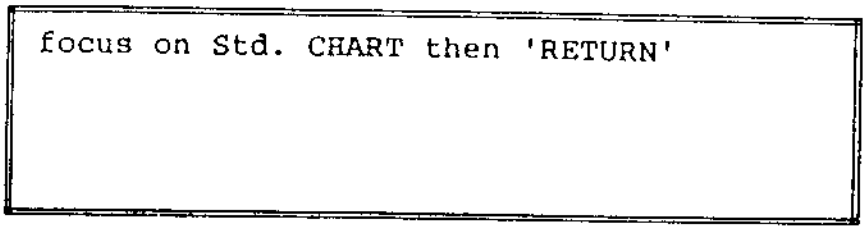
Press the RETURN key. The AF Adjustment screen will reappear.

(3) Press function key F3 in the AF adjustment item screen to display the screen shown below.

(AF Adjustment Item Screen)




F3

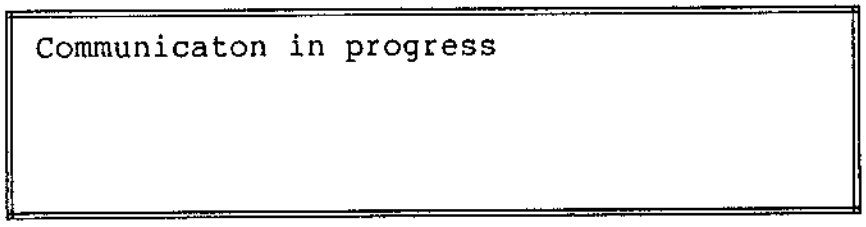



After set.

R E T U R N

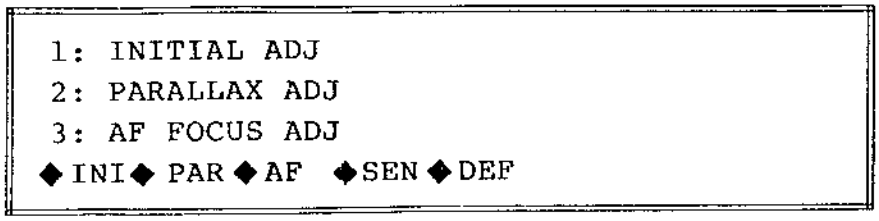
Check that the rangefinder mark is aligned on the chart as shown in the set-up. Do not touch the focusing ring.

(4) Press the RETURN key. Communication with the camera will commence.




(5) When communication is complete, the AF focus adjustment is complete. The screen returns automatically to the AF adjustment item screen.

(AF Adjustment Item Screen)

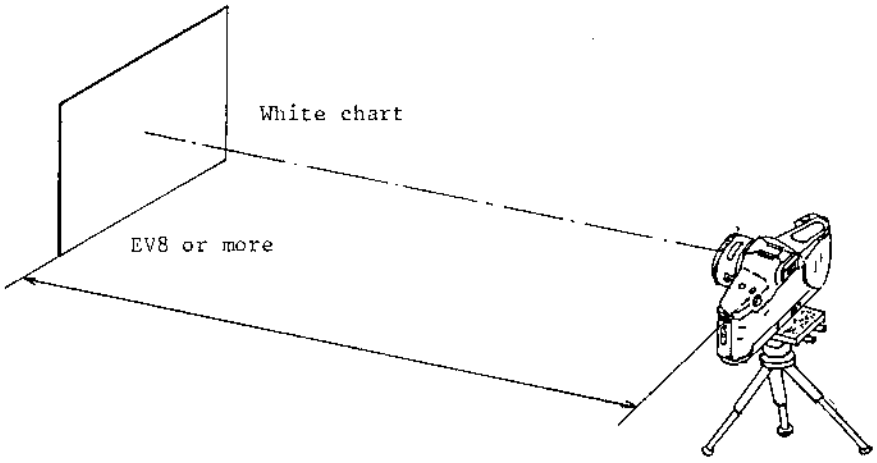


8-D Sensor graph output

The sensor output in graph form is not an adjustment in itself. The graph is mainly used to insure the lighting on the chart is even. It will also indicate if there is dust on the image sensor.

Illumination balance:

(1) Install the tool focusing screen in the camera, and set the camera at the position 2.5 meters ± 10mm away from the chart surface. Set the lens manually to 2.5 meters.




(2) Press function key F4 in the AF adjustment item screen to display the screen shown below.

(AF Adjustment Item Screen)

```
1: INITIAL ADJ
2: PARALLAX ADJ
3: AF FOCUS ADJ
◆INI◆ PAR◆AF  ◆SEN◆DEF
```

F4

```
Communicaton in progress
```

(3) After about ten seconds the communication is completed. The screen goes blank momentarily, then the current BASIS sensor output waveform is displayed.

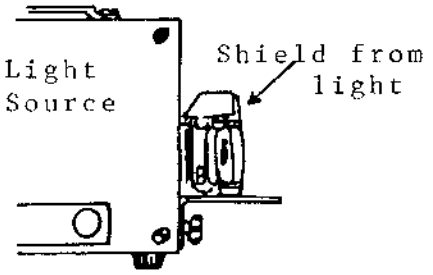
R E T U R N

(4) Adjust the lamp until the output waveform is as flat as possible. Next, check the brightness of the chart surface using a light meter or the cameras meter. (EV8 = 1/8 sec., f/5.6)

(5) Press the RETURN key. Replace the chart with the adjustment chart for the adjustment you are going to perform.

Sensor Dust Check:

(1) Set the camera, without a lens attached, directly against the light source screen. Set the light source to EV12 and shield the camera from the ambient light.




(2) Press function key F4 in the AF adjustment item screen to display the screen shown below.

**(AF Adjustment Item Screen)**

```
 1:INITIAL ADJ
 2:PARALLAX ADJ
 3:FFD ALIGNMENT
◆INI◆PAR◆FFD◆AF ◆SEN
```

F4

```
Communicaton in progress
```

(3) After about ten seconds the communication is completed. The screen goes blank momentarily, then the current BASIS sensor output waveform is displayed.

R E T U R N

(4) If the output waveform is flat, the sensor is clean, If it is quite rough, the sensor is dirty. Try cleaning the mirror and sensor surfaces if a blower and check again.

(5) Press the RETURN key to return to the AF adjustment item screen when finished.

8-E Defocus Output Check

This is the operational procedure for the EOS Tool used in most of the AF checks outlined in the next section. To conserve space it is not repeated each time it is used. Whenever the check refers to the defocus output, use this procedure. It is not necessary to cancel and re-enter this mode for each separate check.

(1) Simultaneously press the F5 function key of the AF adjustment item screen. The "Communication" screen will appear and data exchange with the camera will start.

(AF Adjustment Item Screen)

```
1: INITIAL ADJ
2: PARALLAX ADJ
3: AF FOCUS ADJ
◆INI◆ PAR◆AF  ◆SEN◆DEF
```

F5

```
Communicaton in progress
```

(2) When communication is complete, the screen disappears momentarily and the instantaneous defocus is displayed.

```
DEFOCUS = 0
```

(3) When the required checks are completed, press the RETURN key to leave the defocus mode and return to the AF adjustment item screen.

NOTE: Even if the RETURN key is pressed, the tool will not change modes until it completes the present operation.

8-F AF precision checks

Two series of checks are included. The first listed checks the body using the standard tool lens. The second checks the system with the customers lens.

If the camera being checked is from a customer complaining of poor focus, first check the camera with the customers lens. Then check the body with the standard tool lens. If the body checks good, the lens is most likely faulty.

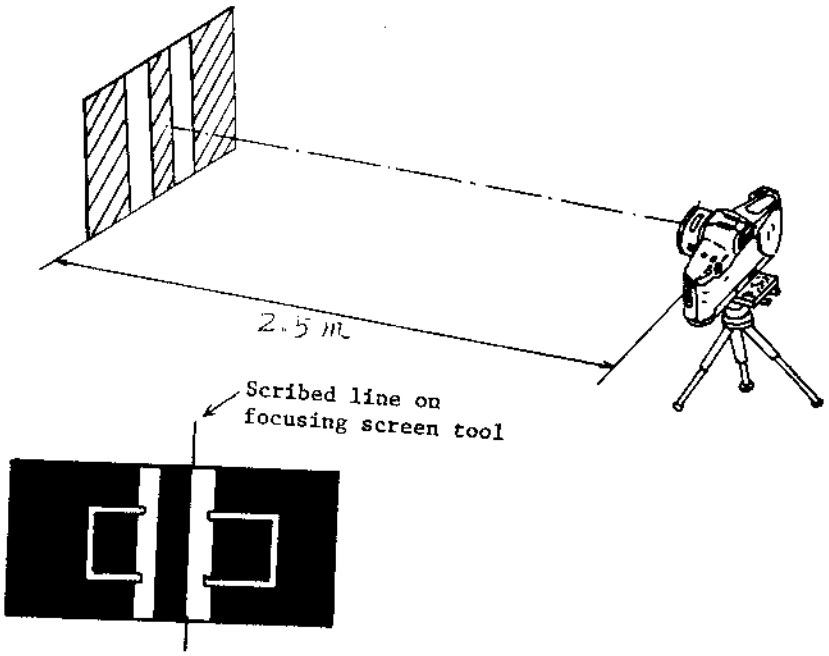
TEST BODY with STANDARD TOOL LENS

(1) Install the tool focusing screen in the camera.

(2) Illuminate the chart in accordance with section 8-D.

(3) Set the AF Standard double bar chart.

(4) Install the standard tool lens. Set the camera 2.5 meters from the chart and align the rangefinder frame on the chart as shown.



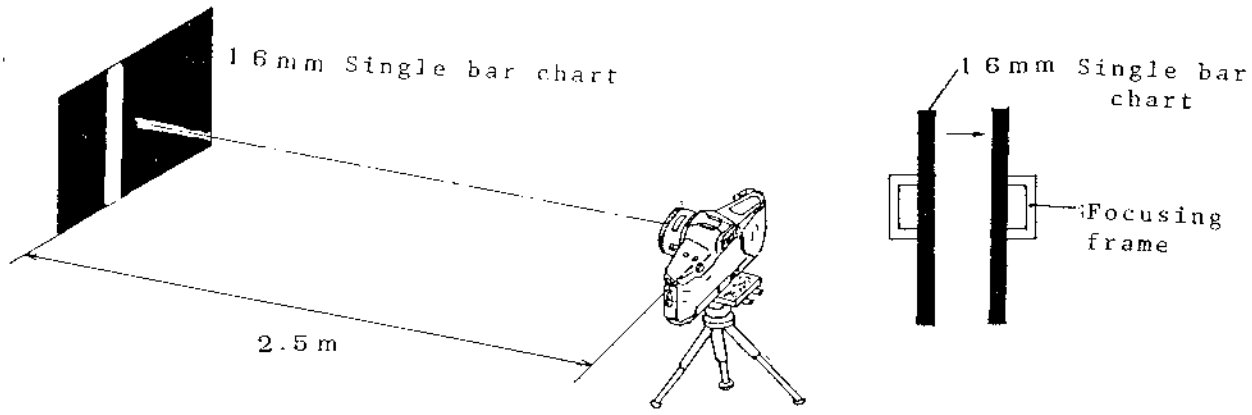

(5) Place the EOS Tool in the "defocus output" mode (8-E).

(6) On the EF tool standard lens, move the focusing ring to infinity and then return it to the reference mark on the focusing scale.

(7) The defocus output should be 0 $\pm$ 0.060 + the variation of the AF Standard Tool Lens*. If not, do the FFD and AF focus adjustments.

*: If the variation is +0.03, the limits would shift to $^{+0.09}_{-0.03}$.

(8) Replace the chart with the single bar chart (16 mm), and align the bar on the left bracket of the rangefinder frame.

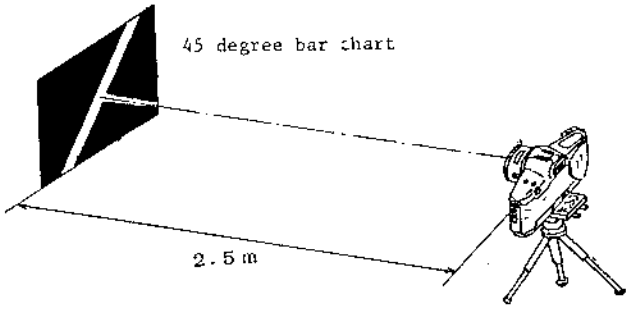


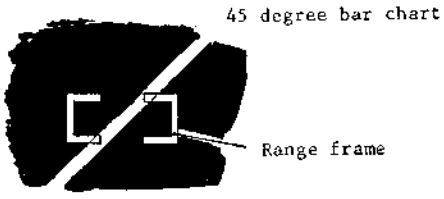

(9) Check the defocus output. It should be 0 $\pm$ 0.090 + the variation of the tool lens.

(10) Shift the bar toward the right in at least five increments and check that the defocus remains within tolerances at all points across the frame.

(11) If any position is not within the standard, either the initial adjustment is not correct or there is dust on the main or sub mirror, or the sensor. Clean them with a blower and readjust.

(12) Replace the chart with the 45 degree bar chart, set as shown.




(13) Check the defocus output. It should be 0 $\pm$ 0.105 + the variation of the tool lens. If not, the AF sensor is bad.

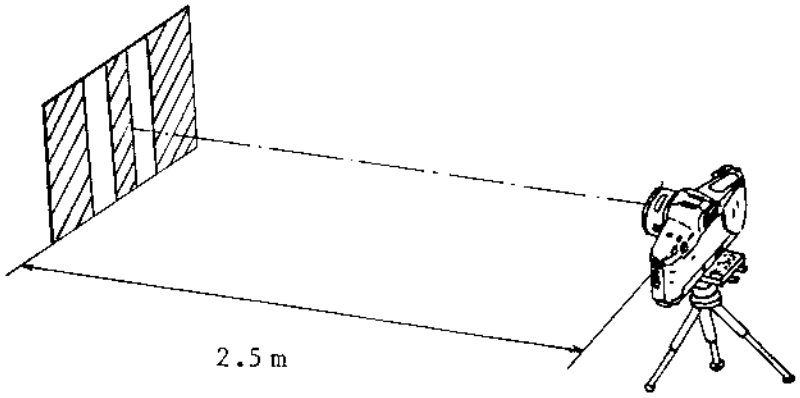
CUSTOMER'S SYSTEM TEST (Test camera and lens)

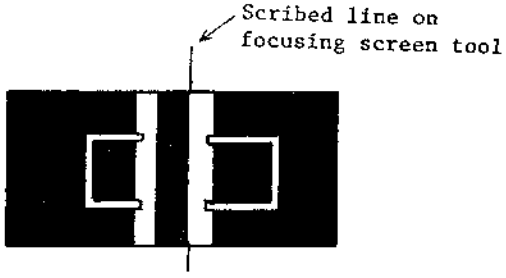
(1) Install the tool focusing screen in the camera.

(2) Illuminate the chart in accordance with section 8-D.

(3) Set the AF Standard double bar chart.

(4) Install the customers lens. Set the camera fifty time the focal length (2.5 meters for a 50mm lens) from the chart and align the rangefinder frame on the chart as shown.




(5) Place the EOS Tool in the "defocus output" mode (8-E).

(6) Put the lens in AF mode and activate the focus.

(7) The defocus output should be as shown in Table 1. If not, check the body with the standard lens again.

(8) Repeat the check several times.

(9) Replace the chart with the single bar chart (16 mm), and do the checks outlined in the body/standard lens section.

(10) Check the defocus output. It should within the limits shown in table 1.

(11) Replace the chart with the 45 degree bar chart, set as shown in the

(12) Check the defocus output. It should be within the limits shown in table 1.

Table 1: DEFOCUS limits by Maximum Aperture

Defocus indicated on EOS Tool

| | Standard Double bar chart | Single bar chart | 45° bar chart |
|---|---|---|---|
| Standard Tool lens | ± 0.060 | ± 0.090 | ± 0.105 |
| Brighter than f/2.8 | ± 0.115 | ± 0.140 | ± 0.155 |
| Brighter than f/4.0 | ± 0.115 | ± 0.145 | ± 0.150 |
| Brighter than f/5.6 | ± 0.140 | ± 0.160 | ± 0.180 |
| f/5.6 or darker | ± 0.180 | ± 0.200 | ± 0.210 |

This chart is applicable for a tool lens with zero variation. Add the variation to the limts to find the limits for your tool lens.

The limits vary with the maximum aperture of the lenses.

Corrective Action:

When the results are not within the limits:

Standard Chart: Perform the FFD adjustment (mechanical), FFD input and AF focus adjustment.

Single Bar Chart: Redo all AF adjustments, 8-A through 8-C

45° Bar Chart: Replace the AF sensor, adjust it again.

8-G Unresolved focusing problems

If a camera and lens has been brought to service with a specific claim of poor autofocusing, but all data in the previous test proves normal, the two most probable causes are:

1. Defective sensor (shock damage or dust)

2. Difficult subjects for autofocus

(1) As a final check of the sensor, substitute the 90:64 low contrast for the standard chart and check the defocus with the standard tool lens. The defocus should be 0 $\pm$ 0.120. If it is within the limits, the body is OK, and it is likely that the subjects the user tried to photograph were not suitable for autofocus. At this point, a definitive solution is possible only if the customers photographs (negatives, slides, or prints) are available. If not, clean the sensor and try again.

(2) Difficult subjects for autofocus

If the customers photographs are available, check them for difficult subjects as outlined on the next page (and in the Instruction Book). Explain the limitations of the system to the customer, so these types of subjects can be avoided or dealt with.

If all else fails, replace the AF sensor.

Table 2: Difficult Subjects for Autofocus

| Subject condition | Cause | Remedy |
|---|---|---|
| Subject has no, or very low contrast | Subject image can not be detected. This is the same (situation as trying to focus your eyes on a white wall. | #1 |
| Subject is very dark (brightness of subject in AF frame is EV 1 or less). | It is impossible to detect the range of image, because the intensity of subject is below the minimum intensity of range sensor. | #2 |
| Subject has no vertical lines. | Because each line sensor is located so that it can detect the horizontal contrast of subject. | #1 |
| Subject has high reflection factor. (like a mirror) | Range can not be measured. Computed signal becomes error signal, because the balance between images is influenced by the extreme reflecting light. | #3 |
| Subject is strongly backlit. | Range can not be measured. Computed signal becomes error signal, because the balance between images is influenced by the extreme backlight. | #3 |
| More than one subject at different distances. | AF cannot determine which subject to focus on | #3 |
| Subject has many vertical lines at equal spaces. | Phase differential cannot be detected. | #3 |
| Subject moving fast directly toward or away from the camera. | Speed exceeds processors capacity. | #3 |

Remedies:

1. Set to the one-shot AF mode, and focus on a contrasty object at the same distance. Recompose and shot.

2. Use either of the EZ Speedlites.

3. Focus manually.

9. OTF accuracy adjustment

This adjustment sets the automatic flash intensity.

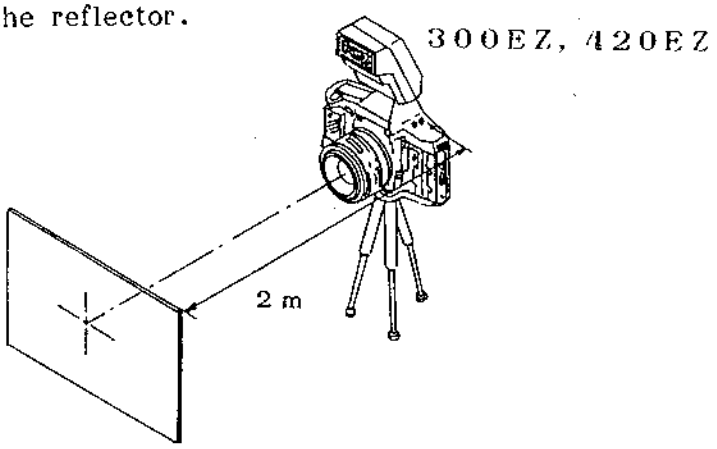
PREREQUISITES: None

TOOLS: EF-500 Tester with DIR-201 adaptor
SPEEDLITE 300EZ or 420EZ
18% gray chart
Normal EF50mm f/1.8 lens
Tripod

Precaution:

Ambient light should be under EV3. If a dark room is not available, establish a test area with stable conditions and no highly reflective objects. Test about ten cameras from stock and establish an average.

(1) put the DIR-201 OTF photosensor in the film plane aperture and set the camera two meters from the reflector.




(1) Press the SHIFT and F1 keys simultaneously (SHIFT + F1 = F6) while the adjustment item screen is displayed. The screen shown below will appear.

(Adjustment Item Screen)

```
 1:SHUTTER
 2:AE
 3:INHIBIT VOLTAGE
◆SHU◆AE ◆INH◆AUT◆AF
```

SHIFT + F1

```
Check OTF Accuracy then 'RETURN'
```

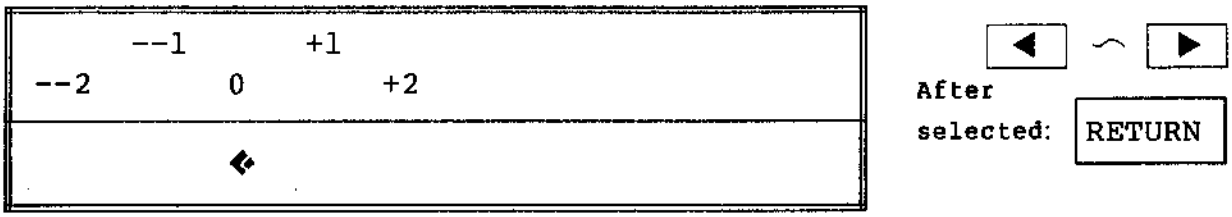
RETURN

When selected incorrectly: Space

(3) Check the flash exposure.

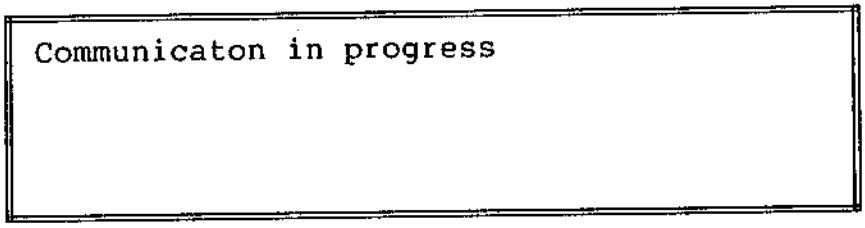
(4) Measure ten times and average the results.

(5) Press the RETURN key to display the screen OTF adjustment screen.

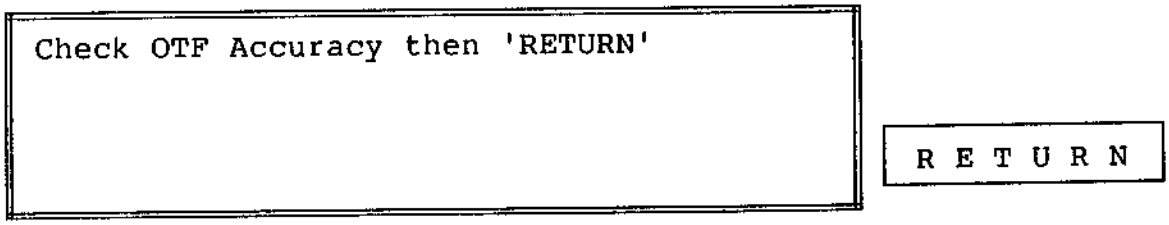



(6) Set the cursor under the average value. (1 step is 0.25EV)

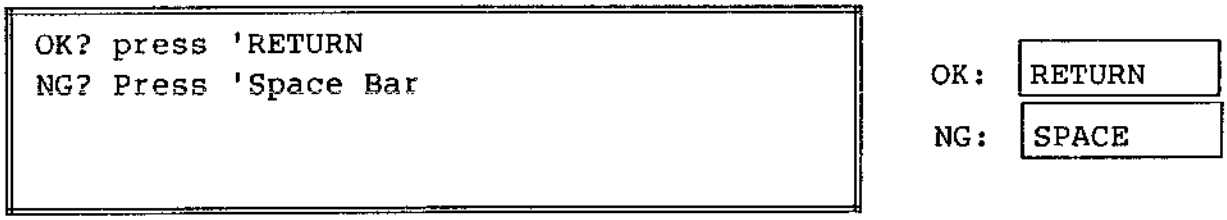
(7) Press the RETURN key. The "communication" screen will appear, and the data is sent to the camera.




(8) When data transmission is complete, the OTF adjustment screen reappears. Check the flash exposure to confirm correct adjustment.



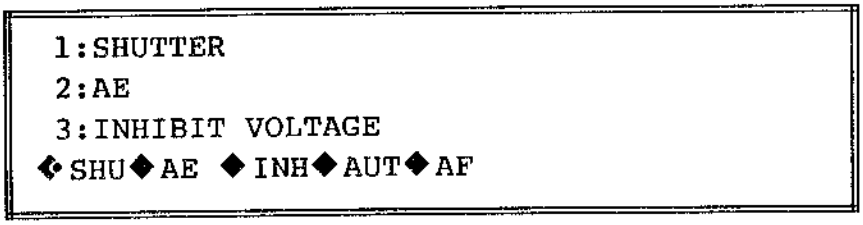
(9) After exposure is confirmed, press the RETURN key to display the screen shown below.



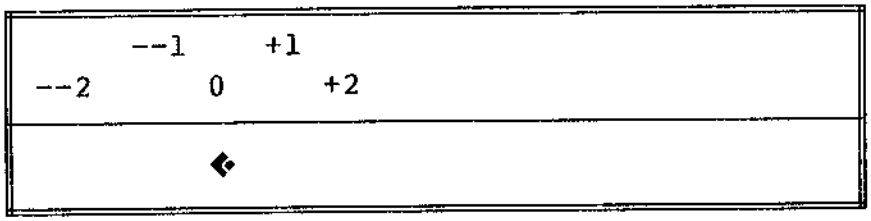

(10) If OK, press the RETURN key, or if NG, press the space bar.

(11) When you press the RETURN key, the adjustment item screen returns.

(Adjustment Item Screen)




(12) When you press the space key, the OTF adjustment screen returns. Repeat the adjustment.



10. IC-4 Replacement

These adjustments are necessary when IC-4 has been changed.

| | |
|---|---|
| 1. Initialization: | This clears any old data so new data can be written. |
| 2. Camera ——> EOS Tool | This is used to temporarily store the cameras data in the EOS tool, so the data is not lost. If the data is lost, every adjustment must be completed. The data from three cameras can be stored. |
| 3. EOS Tool ——> Camera | This reloads the data back into the camera from the EOS Tool. |

Precaution:

When you start a repair which may entail replacing either IC-4 or the entire main flexible printed circuit, it is best to transfer the memory of the camera into the EOS Tool (Step 2). If you do not, it will be necessary to make every adjustment.

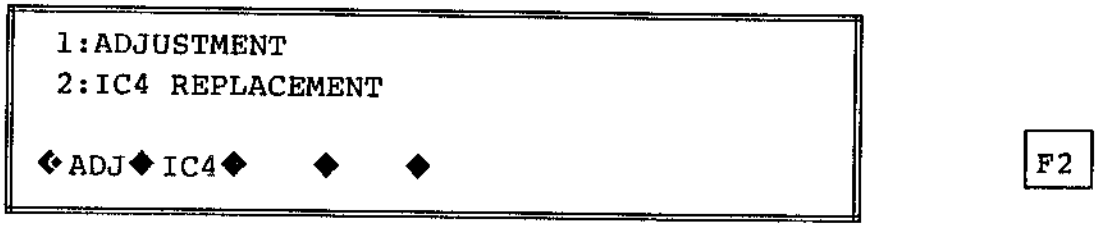
If data from more than one camera is loaded into the tool, be sure to reload the correct data into the camera.

10-A Initialization

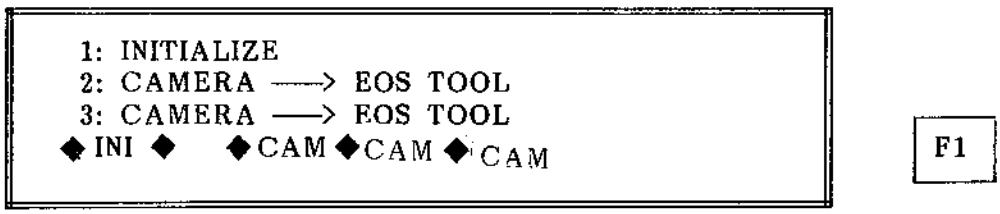
When using this mode, if the data can not be read because of the fault of IC-4 (I/O error), the basic data is transferred to IC 4. When IC-4 is initialized, all previous data is destroyed so every adjustment must be performed.

(1) Press function key F2 in the selection item screen to display the IC-4 Replacement screen.

(Selection Item Screen)

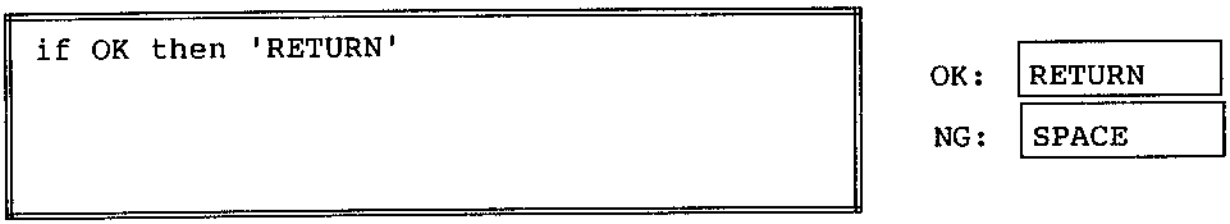



(IC 4 Replacement Screen)

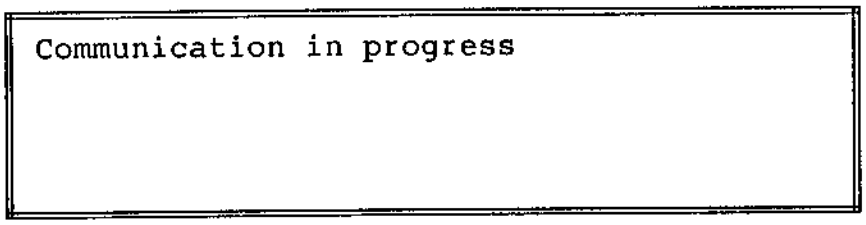



(2) Press function key F1.

(3) The screen as shown below is displayed. If you want to initialize IC-4, press the RETURN key. If not, press the space key.

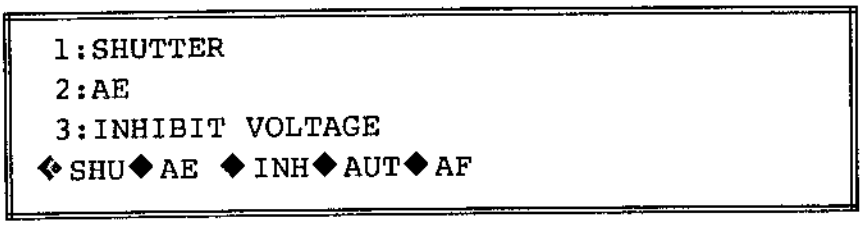



(4) If the RETURN key is pressed, the "communication" screen appears and the EOS Tool clears any old data from IC-4 and writes the basic data into it.




(5) After communication is completed (about 30 seconds later), an audible signal is emitted and the adjustment item screen reappears.

(Adjustment Item Screen)



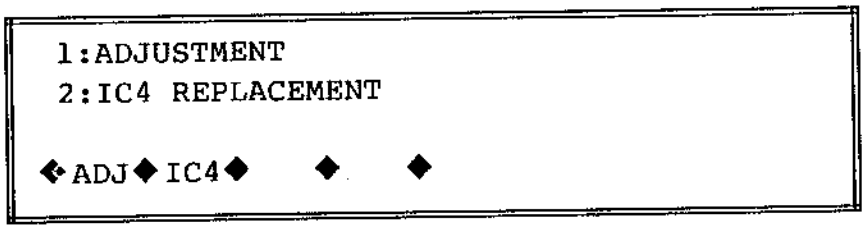

(6) If the space bar is pressed instead of the RETURN key, the screen reverts to the IC-4 Replacement screen.

10-B Camera ---> EOS tool

This mode is used to transfer data from the camera into the EOS Tool prior to replacing the main flex or IC-4. By using this procedure and then re-entering the data back into the camera (section 10-C) after the parts are replaced, it is not necessary to do all of the adjustments.

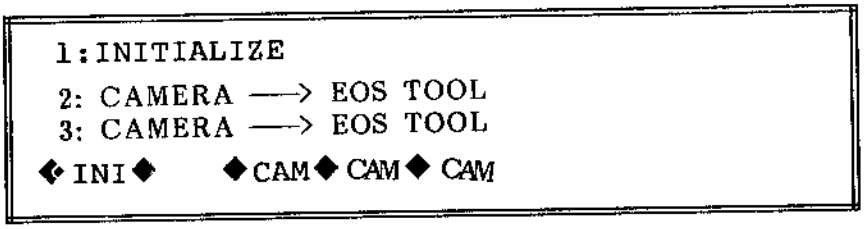
(1) Press function key F2 in the selection item screen to display the IC-4 Replacement screen.

(Adjustment Item Screen)




F2

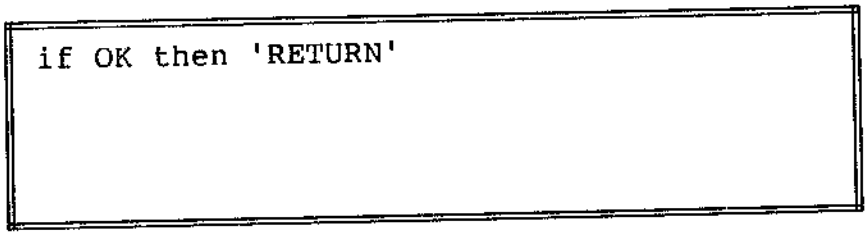
(IC 4 Replacement Screen)




F3

(F3 - F5)

(2) Press function key F3. The decision screen will appear. To transfer the data from the camera to the tool, press RETURN key. If you decide not to transfer data, press the space key.




OK: RETURN

If selected incorrectly: SPACE

(3) When you press the RETURN key, the "communication" screen appears, and data is transferred from the camera to the tool.

```
Communication in progress
```

(4) After communication is completed (about 30 seconds later), a audible signal is emitted and the adjustment item screen reappears.

(Adjustment Item Screen)

```
 1:SHUTTER
 2:AE
 3:INHIBIT VOLTAGE
◆SHU◆AE ◆INH◆AUT◆AF
```

(5) If the space bar is pressed instead of the RETURN key, the screen reverts to the IC-4 Replacement screen.

10-C EOS tool ——> Camera Data Transfer

This mode is used to transfer data from the EOS Tool into the camera after replacing the main flex or IC-4. By using this procedure along with the reverse procedure prior to removing the parts which must be replaced, it is not necessary to do all of the adjustments.

(1) Press function key F2 in the selection item screen to display the IC-4 Replacement screen.

(Selection Item Screen)

```
1:ADJUSTMENT
2:IC4 REPLACEMENT
3:DEBUGGER
◆ADJ◆IC4◆DEB◆RAM◆
```

F2

(IC 4 Replacement Screen)

```
1: INITIALIZE
2: CAMERA ——> EOS TOOL
3: CAMERA ——> EOS TOOL
◆INI◆     ◆CAM◆ CAM ◆CAM
```

[SHIFT] + [F1] - [F3]

(2) Press function key F5. The decision screen will appear. To transfer the data from the tool to the camera, press RETURN key. If you decide not to transfer data, press the space key.

```
if OK then 'RETURN'
```

OK: RETURN

If selected incorrectly: SPACE

(3) When you press the RETURN key, the "communication" screen appears, and data is transferred from the camera to the tool.

```
Communication in progress
```

(4) After communication is completed (about 30 seconds later), a audible signal is emitted and the adjustment item screen reappears.

(Adjustment Item Screen)

```
 1:SHUTTER
 2:AE
 3:INHIBIT VOLTAGE
◆SHU◆AE ◆INH◆AUT◆AF
```

(5) If the space bar is pressed instead of the RETURN key, the screen reverts to the IC-4 Replacement screen.

# III HELP!

## 1. "I/O Error"

I/O Error is displayed when communication with the camera is not executed properly. Confirm the following items.

(1) Confirm that the battery is installed in the camera.

(2) Clean the contacts between the camera and the EOS Tool's grip unit and try again.

(3) Improper contact between the camera and grip unit is the most likely cause. Remove and attach the grip unit several times and try again.

## 2. "Low Battery" Indication

See Chapter I, section 4 for battery replacement procedures.

## 3. Pressing the space key does not display the previous screen.

During communication with the camera or after communication has just been completed, the space bar does not operate in this manner. This is not a malfunction.

## 4. System Termination

Press the power off switch. To start again, press the ON switch to return to the first screen, and proceed normally.

## 5. EOS Tool Battery

Installed "shelf life" of the battery is about six months. In normal operation (two hours a day), it is about three months.

## 6. Camera Battery

Current flow in the camera during communication between the EOS tool and camera is quite high (200mA). Use a shop battery for the test. Do not use the customers battery.

## 7. Connect the camera and grip unit only while using the EOS Tool to prevent unnecessary battery consumption.

8. "Create System" display

   In this case, press the keys as shown below.

   Y  RETURN

9. "#FS Error" display

   In this case, press the keys as shown below.

   Y  RETURN

MEMO

# GENERAL INFORMATION

## CONTENTS


| | | |
|---|---|---|
| I | Design Specifications ..... | I-1 |
| II | System Operation and Control ..... | II-1 |
| III | Functional Description ..... | III-1 |
| | 1. Rangefinding Principle ..... | III-1 |
| | 2. Spool & Sprocket Drive ..... | III-4 |
| | 3. Mirror Mechanism ..... | III-6 |
| | 4. Viewfinder Information ..... | III-7 |
| | 5. Electrical Contacts ..... | III-8 |
| | 6. EOS Evaluative Metering ..... | III-9 |
| IV | Electrical Description ..... | IV-1 |
| V. | Electrical Diagrams ..... | V-1 |
| VI | Notes Concerning Use ..... | VI-1 |
| | [1] EOS Body & Lens System ..... | VI-1 |
| | [2] Flash System ..... | VI-6 |
| | [3] Data Backs System ..... | VI-6 |
| | [4] Precautions applying also to T-series ..... | VI-8 |

# I. Design Specifications

Most specifications for the EOS 650 and 620 are exactly the same, so both models will be listed together. When they differ, it will be indicated,[EOS 650] and (eos 620).

## 1. General

1-1 Type: 35 mm AE/AF Single lens reflex camera with power winder and focal plane shutter (vertical travel)

1-2 Frame size: 24 mm x 36 mm

1-3 Lenses used: Canon EF lens series (uses maximum aperture metering; stopped-down metering is not possible) (Canon FD, FL, and R lens series are not usable.)

1-4 Standard lens: EF 50mm f/1.8

1-5 Lens mount: New Canon Mount (bayonet mount)
Throat diameter - 54 mm (outside diameter - 65 mm); lens attachment rotation angle - 60°

## 2. Autofocus (AF)

2-1 Type: TTL-SIR (TTL secondary imaged registration)

2-2 Focusing Modes: There are two AF modes and manual focusing.

1. One-shot AF mode: In this mode, the autofocus determines the correct distance, focuses the lens to that distance and stops. The shutter will not release until focusing is complete.

2. Servo AF mode: Focus is continuously adjusted to follow subject movement. The shutter can be released at any time, regardless of whether ranging has been completed or not.

3. Powered Manual: This mode allows the user to focus the lens, although the actual lens movement is accomplished by the autofocus drive. The switch is located on the lens, not the camera body.

2-3 AF operation: AF operation starts when the shutter button is pressed halfway.

2-4 AF operating speed: 0.4 sec. (from infinity to one meter with the standard EF 50mm f/1.8 lens)

2-5 AF focus indicator: LCD indicator inside viewfinder and an electronic beeper, which can be turned off with the main switch.

2-6 AF Working Range: EV 1 to EV 18 (ISO 100)

2-7 AF auxiliary lighting: When used with either the Speedlite 300EZ, 420EZ, or Ring Macrolite ML-3, the AF illuminator projects an infrared (peak at 700nm) patterned beam when the shutter button is pressed halfway.

2-8 Autofocus / Winding Mode Relationships

| Winding mode | Autofocus Mode | |
|---|---|---|
| | One-shot AF | Servo AF |
| Single exposure (S) | AF and AE lock when focusing completed. | Continuous focusing and metering until SW2 goes on. |
| Continuous (C) | AF and AE lock when focusing completed, remains fixed during sequence exposure | Continuous focusing during exposure (follow focus) |

3. Viewfinder

3-1 Type: Eye-level SLR using pentaprism. (Fixed pentaprism without condenser lens.)

3-2 Focusing screens: Type C screen is standard. Replaceable through lens mount.

Seven interchangeable screens: (A,B,C,D,H,I,L) (Focusing aids are the same as previous screens with the same letter designation.

3-3 Viewfinder power: -1 dpt (with eye point at 19.3 mm)

3-4 Field of view: 94%, both vertically and horizontally

3-5 Magnification: 0.8X (with 50 mm lens at infinity)

3-6 Viewfinder information:

LCD SEVEN SEGMENT DISPLAY

1. Shutter speed (warning indicator flashes at 2 Hz when speed is outside of coupling range)

2. Aperture value (warning indicator flashes at 2 Hz when outside of coupling range)

3. Metered manual exposure level (OP,oo,CL)
   OP: Open the diaphragm
   oo: correct exposure
   CL: Stop down the diaphragm

4. [EOS 650 ONLY] Depth-of-field priority AE mode (dEP 1,dEP 2):

LCD MASKED CHARACTER DISPLAY

5. * (eos 620 only): AE lock (displayed only in spot metering mode)

6. M : Manual

7. ϟ : Flash charge complete

8. + / - : Exposure compensation

9. ● : AF focusing complete (flashes at 8 Hz when subject cannot be focused)

Note: Indicators cannot be turned off. Has built-in LCD illumination window (with constant LED illumination).

3-7 Mirror: Motor-driven half mirror (mirror cannot be raised manually) Finder black-out time is 200 ms or less at shutter speeds of 1/60 sec. or greater.

3-8 Mirror cut-off: None to 800mm, f/5.6

3-9 Depth of field confirmation: by button on left side of lens mount

3-10 Eyepiece shutter: None

3-11 Other: Angle finders, magnifier, dioptric lens (type S and special EOS type with eye cup) can be attached to eyepiece. Special EOS type is provided as standard accessory.

4. Exposure control

4-1 Metering system: TTL full aperture metering using SPC. Either of the following two systems can be selected.

1. Evaluative metering

2. Central area (partial) metering (8 mm spot; coverage is about 6.5% of screen).

4-2 AE control system: Selectable from among the following six AE modes, plus manual.

1. Shutter priority AE (no safety shift function)

2. Aperture priority AE (no safety shift function)

3. Intelligent program AE
   [EOS 650 ONLY]: shift not possible

4. A-TTL program flash AE

5. TTL program flash AE

6. [EOS 650 ONLY] Depth-of-field priority AE

7. Manual (metered manual)

4-3 Coupling range of metering: EV +1 to 20 IF using 50 mm f/1.4 lens at ISO 100 (At normal temperatures, EV -1 to 20)

4-4 Out of coupling range warning: External indicator and LCD digital indicator in viewfinder flash at 2 Hz)

4-5 Exposure read-out: Displayed when shutter button pressed to first level. 8-second timer operates when shutter button is released.

4-6 Film speed: ISO 6-6400, automatically set in 1/3-steps by DX code. Can also be set manual in range from 25 to 5000. If film loaded does not have DX code, previous ISO speed flashes to show need for manual setting.

4-7 Exposure compensation: $\pm$ 5 stops in 1/2-stop increments

(eos 620 only) 1. Automatic Bracketing (AEB)

A. Operation: Possible in all modes indicated in 4-2 above except for modes (4), (5), and bulb.

B. Bracketing range: $\pm$5 stops in $\frac{1}{2}$-stop increments

C. Number of exposures: Three continuous exposures (one each with underexposure, standard exposure, and overexposure)

D. Compensation: The shutter speed is varied in all modes except shutter priority, where the aperture is varied. In program, both the shutter and aperture are varied.

(eos 620 only) 2. Manual setting: $\pm$ 5 stops in $\frac{1}{2}$ stop intervals

(eos 620 only) 3. (1) and (2) above can be used in combination.

4-9 (eos 620 only) Multiple exposures: Multiple continuous exposures possible with automatic reset. Multiple exposures can be preset to a maximum of 9. (Exposure interruption and reset are also possible.)

4-9 AE lock: By special AE lock button. Metering automatically switches to central area (partial) metering). With evaluative metering, AE lock operates automatically when AF lock operates.

5. Shutter:

5-1 Type: Vertical-travel focal plane shutter with electronic control at all speeds. Attraction-type EM control for both first and second curtains.
Curtain travel time: [EOS 650]: 6.0ms (24mm)
(eos 620): 3.3ms (24mm)

5-2 Shutter speeds: [EOS 650]: 1/2000 to 30 sec.;X sync: 1/125 sec.
(eos 620): 1/4000 to 30 sec.; X sync: 1/250 sec.

Speed display: Seven segment LCD

Speed setting: Shutter speed can be set in 1/2-step increments for both shutter priority AE and manual. With bulb setting, elapsed time (up to 120 seconds) is indicated by bar graph on LCD panel. (One segment of bar graph lights for every 30 seconds of elapsed time.)

5-3 Shutter release: Soft-touch electromagnetic release system (no cable release socket).

5-4 Release time lag (excluding AF operation time):

1. From SW-2 ON to exposure after pausing briefly at SW-1 ON: 100ms

2. When SW-1 and SW-2 go ON simultaneously: Servo-190ms; 1-Shot-230ms

5-5 Self timer: Electronically controlled; release after 10 sec.

1. One-shot AF mode: Self timer starts when AF operation is completed (AE value is locked at this time) and shutter button is pressed to second level. (Timer does not start until AF operation has been completed even if shutter button is pressed all the way.)

2. Servo AF mode: Timer starts and AE value is locked when shutter button is pressed to second level, regardless of whether AF operation has been completed.

Self timer operation is indicated by LED. (LED flashes at 2 Hz for first 8 seconds, then flashes at 8 Hz for remaining 2 seconds). Remaining time is also indicated by digital indicator on external LCD (same as the T-90).

5-6 Camera shake warning: Warning is provided for program, aperture priority, and depth-of-field priority AE modes. When shutter speed (TV auto) falls more than 0 to 0.5 steps below one divided by the lens focal length, the beeper beeps rapidly.

6. Film Transport

6-1 Loading: Automatic loading (spool & sprocket drive during loading)

Automatic First frame positioning starts automatically upon inserting film and closing back cover. During autoloading, the shutter does not open. Film advance stops automatically when film counter reaches "1". (Time required: About 1.5 sec.)

6-2 Film advance: Film is advanced automatically by a special miniature coreless motor inside the spool.

6-3 Advance modes: Two selectable modes, single-shot and continuous exposure.

6-4 Take-up start: Immediately upon exposure completed signal.

6-5 Take-up speed: Approx. 3 frames/sec. with continuous exposure. (With single-shot mode, film advances at equivalent speed for one frame.)

6-6 Transport verification: By floating bar mark (->) on LCD panel.

6-7 Battery Life: One 2CR5 lithium battery will transport approx. 150 rolls of 24 exposure film or 100 rolls of 36 exposure film at normal temperatures (20°C). At low temperatures (-20°C) the numbers are 15 and 10 rolls respectively.

6-8 Film rewind system: Automatic rewind by miniature motor
(eos 620 only): miniature coreless motor

6-9 Rewind start: Automatic (can be turned off for service)

1. Operates after 36 exposures

2. Operates when end of film is detected by film tension

Manual rewind can be initiated at any time by pressing manual rewind button.

6-10 Rewind verification: By floating bar mark (<-) on LCD panel, and by decrementation of film counter number.

6-11 Rewind time:(normal temperature)

| | EOS 650 | eos 620 |
|---|---|---|
| 24 exp. film | Approx. 10 sec. | Approx. 7 sec. |
| 36 exp. film | Approx. 15 sec. | Approx. 10 sec. |

6-12 Rewind stop: Rewind stops after leader rewound into cartridge.
(eos 620 only): Can be modified by service to leave tongue out

6-13 Rewind-completed indicator: Cartridge mark on LCD panel flashes at 2 Hz.

6-14 Film loaded/empty verification:

1. Constant display by cartridge mark on LCD panel

2. Visual verification by film window (with standard back cover only)

6-15 Film counter: Additive digital electronic display on LCD panel. (Counter decrements during film rewind.)

7. Body

7-1 Back cover: Removable; opened by release lever (equipped with safety lock). Has film verification window, but no memo holder.

7-2 Flash contacts: Dedicated X sync hot shoe

7-3 Flash Dedication:

1. Dedicated Flash: Speedlites 300EZ and 420EZ are dedicated flashes designed for the EOS system. They provide TTL automatic flash for the EOS cameras. The exact mode of operation varies depending on the exposure mode selected on the camera. For details, seen the specifications for the flash units.

2. Non-dedicated Flash:

A. T and A series flashes can be used as non-dedicated automatic flash units.

Shutter speed: Manually set from top sync speed to 30 sec.
Aperture: Set manually on both body and flash.

B. General purpose electronic flashes:
Ordinary miniature flashes: Synchronized exposure is possible at speeds up to maximum.
Large, studio-type flashes: Synchronized exposure is possible at speeds up to 1/125 sec. (Effect of flash duration requires verification.)

7-4 Power supply: One 2CR5 6V lithium battery. Fits into bottom of body. (Batteries other than the 2CR5 cannot be used.) Battery can be replaced by removing grip.

7-5 Main switch: OFF when selector set to "L"

7-6 Battery check: 3-step bar mark shows battery condition in three steps (four including OFF) upon pressing BC button.

3 Bars lit: 50 to 150 rolls (24 exp.) possible

2 Bars lit: 20 to 50 rolls possible

1 Bar lit: 1 to 20 rolls possible

7-7 External indicators: Large LCD panel
(eos 620 only): with illuminator

7-8 Tripod thread: ¼" / 20 standard (US) tripod socket

7-9 Remote control: (eos 620 only): Standard
[EOS 650 ONLY]: Possible with optional grip

7-10 Grip replacement: Possible (three types including standard grip)

7-11 Body material: Die-cast aluminum central aperture portion insert molded into glass-fiber reinforced polycarbonate resin

7-12 Body color: Black (semi-gloss paint with sanded texture) and dark gray

7-13 Dimensions: 148(W) x 108.3(H) x 67.5(D) mm (Body thickness: 50.1mm)

7-14 Weight: [EOS 650]: 660g + 40g battery
(eos 620): 700g + 40g battery

## II. System Operation and Control

As is shown in Figure 1, the basic EOS system is comprised of the body, lens, flash, and interchangeable back. An intricate combination of sensors, microprocessors, actuators, illumination elements, switches, and power supplies are arranged into a highly advanced functional whole.

Fig. 1: Control System Structure

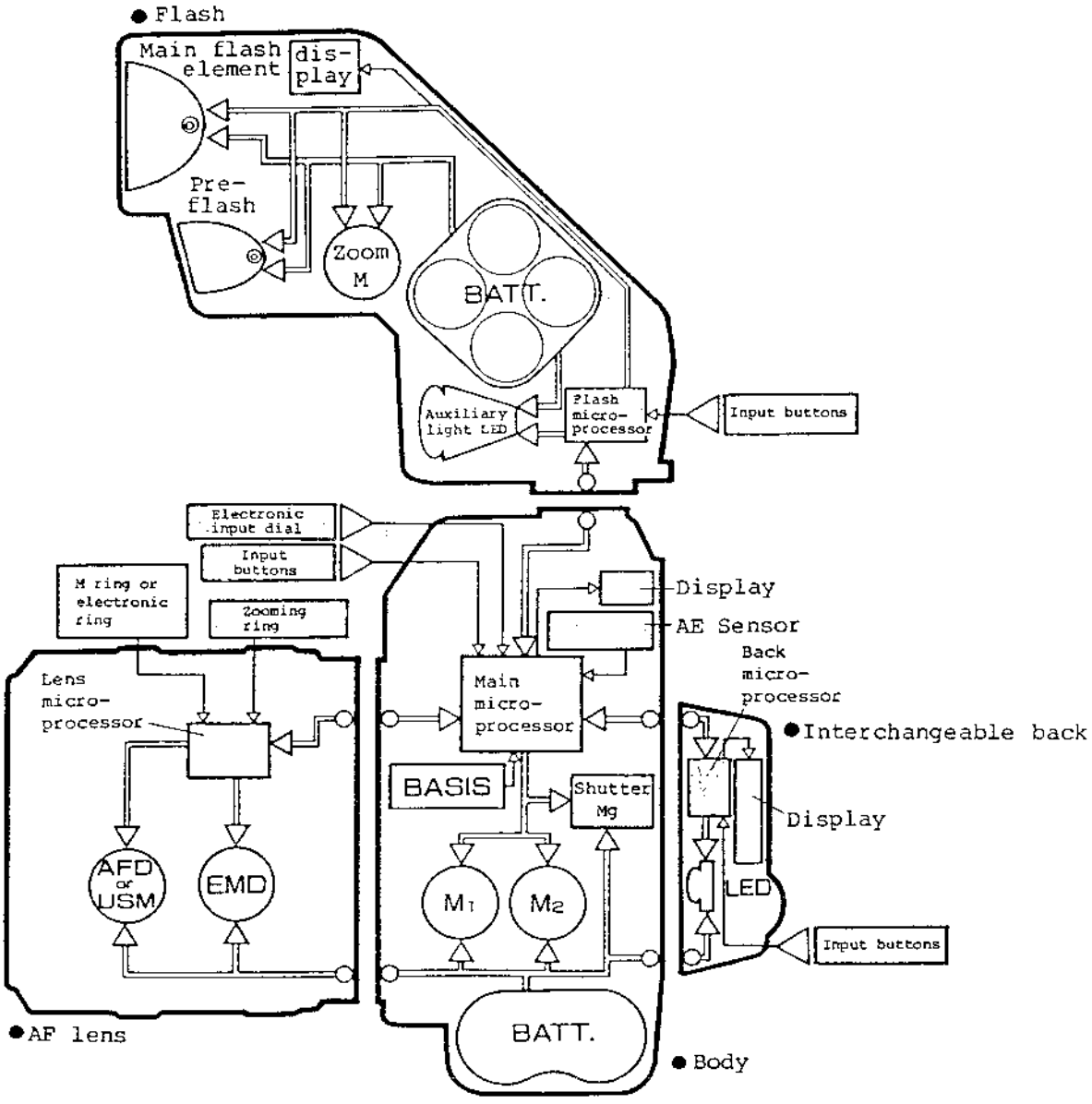
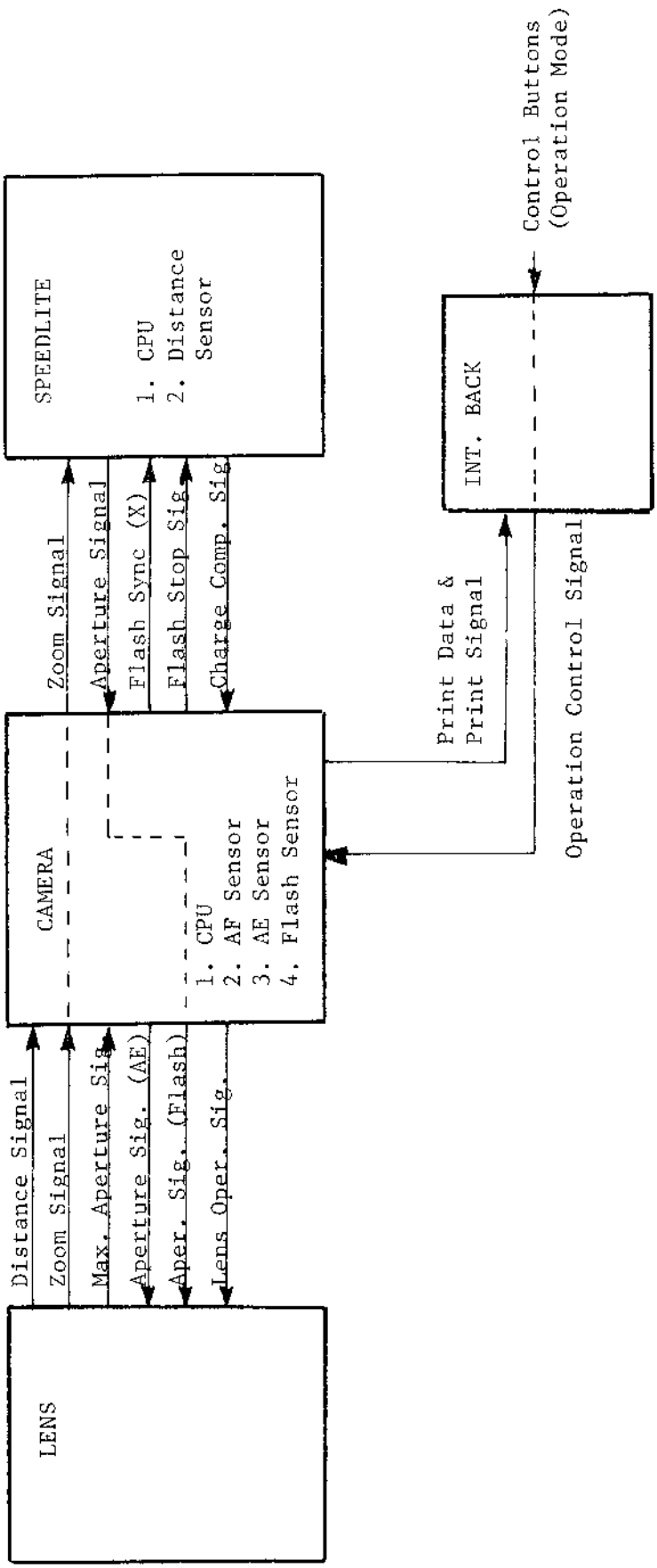


Fig. 2: System Signals

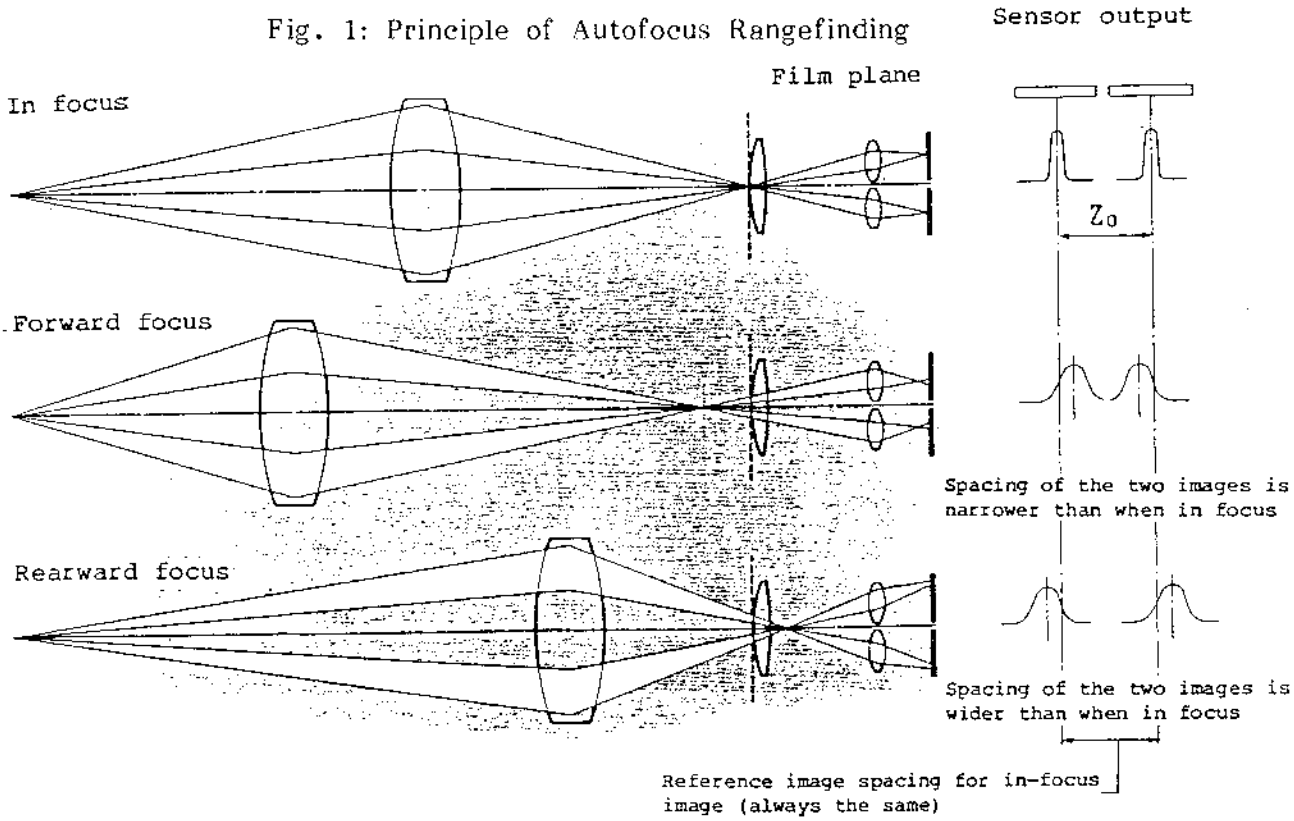


# III. Functional Descriptions

## 1. Rangefinding Principle

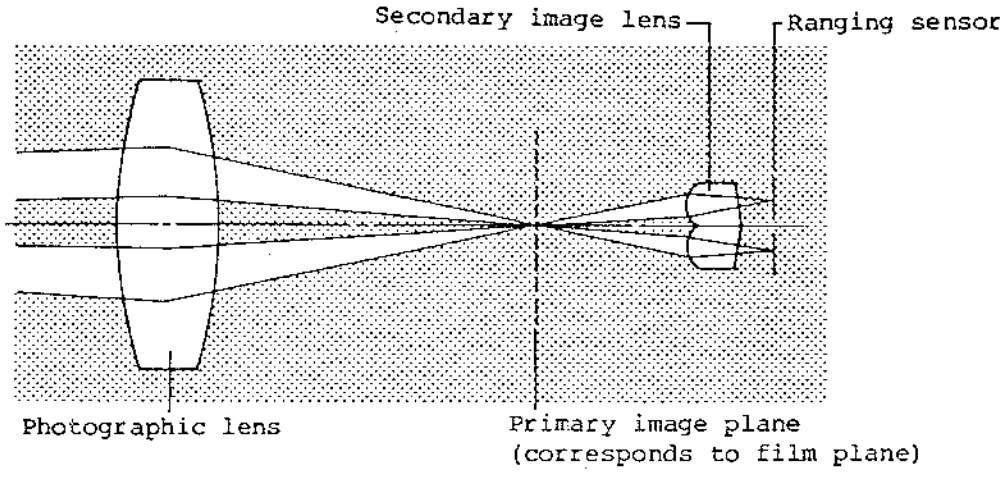
The EOS AF system uses "TTL-SIR" (through the lens secondary imaged registration) for automatic rangefinding. The basic principle belongs to the same category of TTL passive-type phase detection systems as used in autofocus SLRs marketed by Minolta, Nikon, and Olympus.

Fig. 1: Principle of Autofocus Rangefinding


Sensor output
Film plane
In focus
Forward focus
Rearward focus
$Z_0$
Spacing of the two images is narrower than when in focus
Spacing of the two images is wider than when in focus
Reference image spacing for in-focus image (always the same)

When focus is in front of the subject (front focus) or behind the subject (rear focus), correct focus is achieved by moving the lens to bring image spacing to the reference spacing.

Fig. 2: Secondary Image Lens (light path for EOS ranging)



The following conclusions can be drawn from this figure:

1.1 In the in-focus condition, two sharp images are formed on the surface of the sensor. The space between these two images is defined as "Z0".

1.2 In the front focus condition, two blurred images are formed on the surface of the sensor. The space between the two images is narrower than Z0.

1.3 Two blurred images are also formed on the sensor in the rear focus condition, but in this case the space between the two images is wider than Z0.

In cases (2) and (3), the deviation from Z0 increases in proportion to the amount by which the image is out of focus. The amount of defocus can be determined by detecting the relative positions of the two images on the sensor.

2. Structure of the EOS AF optical system

Two beams of light are focused on the equivalent focal plane and pass through separator lenses ( two lens / prisms side-by-side formed from a single piece of material which resemble eyeglasses - hence the nickname "spectacle lenses") and are focused onto the surface of the ranging sensor. The light passing through the spectacle lenses remains the same to apertures as small as f/7.6. Some of the features of this AF optical system are listed below.

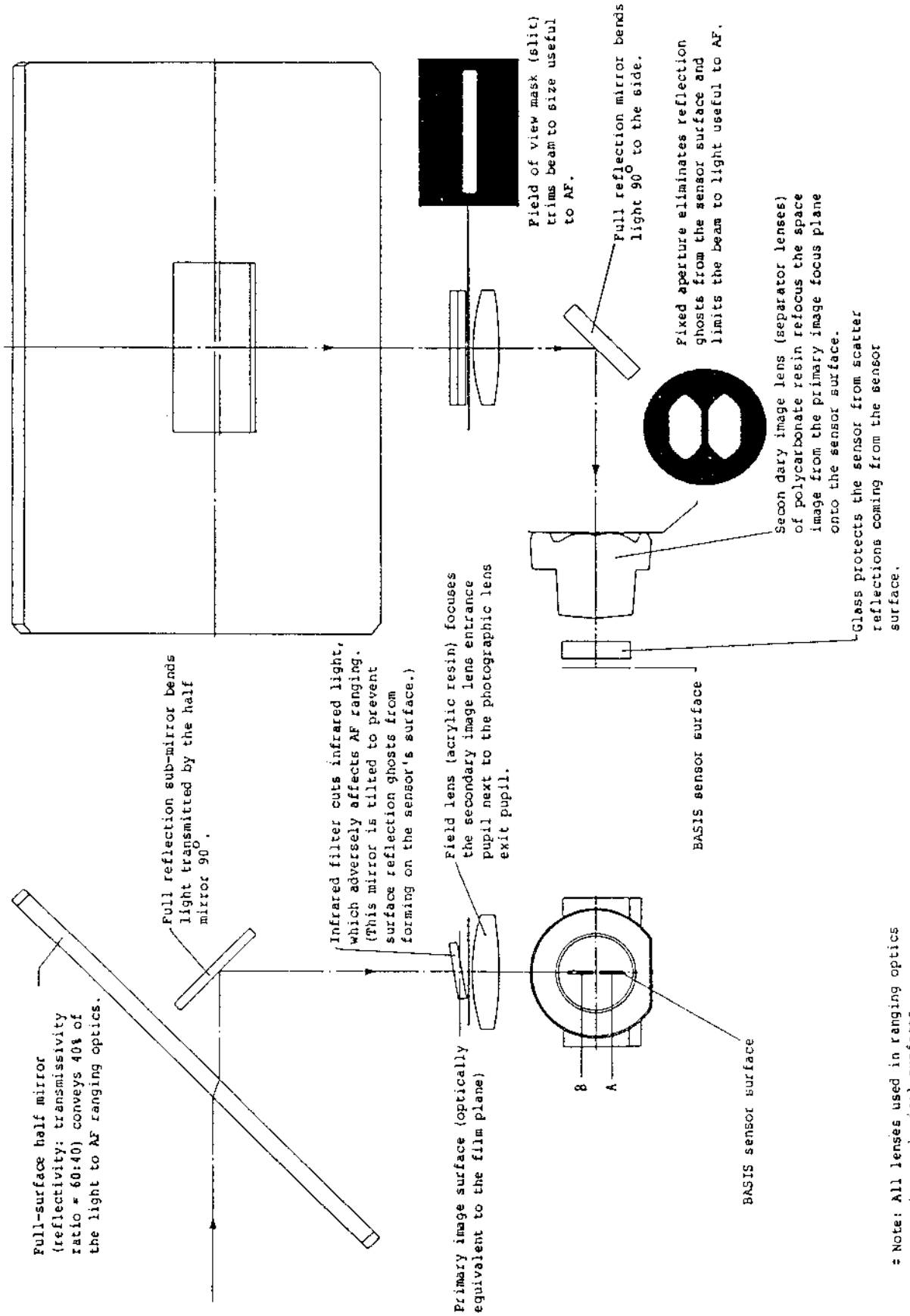
2.1 It provides a wide effective AF field of view. The field of view of AF ranging is determined by the effective field of view of the sensor. With the EOS AF system, optimized matching of the optical system to the sensor greatly increases prediction* capability.

* : "Prediction" in this sense refers to the ability to estimate the amount by which the image is out of focus from the relative positional deviation of the two images.

2.2 The separator lenses and prism are combined into one unit. This enhances precision by minimizing differences in image height and changes in wavelength in the two images formed on the sensor surface.

2.3 Performance is stable under varying environmental conditions. In order to achieve stable twin-image formation under varying temperature and humidity conditions, it is important that a constant distance be maintained between the optical centers of the separator lenses. The EOS lenses are made of polycarbonate resin which absorbs very little moisture. (The moisture absorption expansion rate is about 1/10 that of the optical acrylic resin commonly used.) This keeps the effect of changes in humidity to a minimum.

Fig. 3: Autofocus Optics


Full-surface half mirror (reflectivity: transmissivity ratio = 60:40) conveys 40% of the light to AF ranging optics.
Full reflection sub-mirror bends light transmitted by the half mirror 90°.
Infrared filter cuts infrared light, which adversely affects AF ranging. (This mirror is tilted to prevent surface reflection ghosts from forming on the sensor's surface.)
Primary image surface (optically equivalent to the film plane)
Field lens (acrylic resin) focuses the secondary image lens entrance pupil next to the photographic lens exit pupil.
B
A
BASIS sensor surface
BASIS sensor surface
Secondary image lens (separator lenses) of polycarbonate resin refocus the space image from the primary image focus plane onto the sensor surface.
Glass protects the sensor from scatter reflections coming from the sensor surface.
Fixed aperture eliminates reflection ghosts from the sensor surface and limits the beam to light useful to AF.
Full reflection mirror bends light 90° to the side.
Field of view mask (slit) trims beam to size useful to AF.
* Note: All lenses used in ranging optics have spherical surfaces.

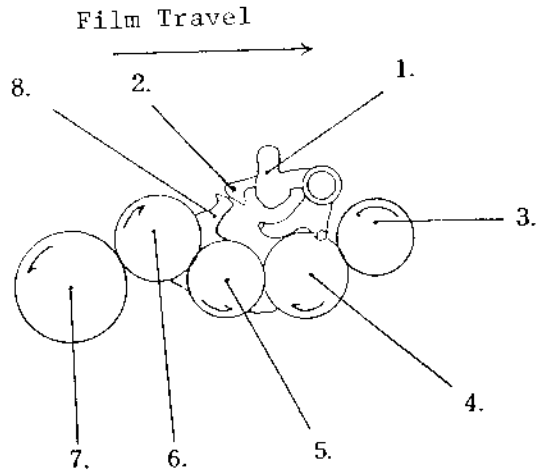
2. Spool & Sprocket Drive

When a cartridge is installed, the cartridge switch is turned off. When the back cover is closed, the back cover switch is turned off and autoloading starts.

During autoloading, both the spool and sprocket are driven for three frames. Since the circumference of the spool is longer than one frame (eight perforations on the sprocket), the film starts to tighten.

At the end of the three frames the motor reverses the spool for about 80ms to switch to spool only drive. The hold lever holds the sprocket planet gear freeing the sprocket. The motor again drives the spool in the forward direction to advance one additional frame and autoloading is complete.

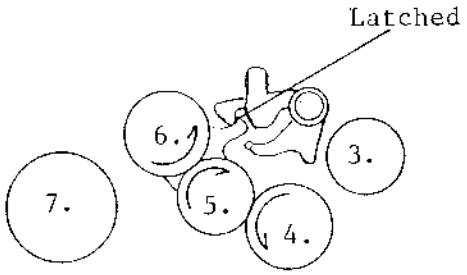
1. Release Lever
2. Hold Lever
3. Spool Drive Gear
4. Spool Planet Gear
5. Sun Gear
6. Sprocket Planet Gear
7. Spool Drive Gear
8. Planet Arm
   (with hold lever claw)




Motor: Forward

When the sun gear (5) turns in the normal direction, the spool and sprocket planet gears (4) and (6) are forced against there respective drive gears (3) and (7) and both the spool and sprocket are driven. This continues for three frames lengths of film.

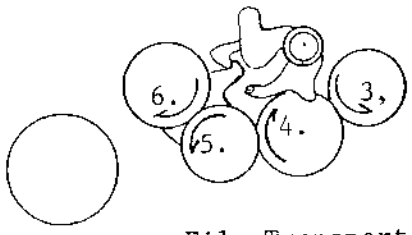
The sun gear (5) then reverses. This pulls the planet gears away from the drive gears and the sprocket and spool stop. The planet arm (8) latches with the hold lever (2), also.




Motor: Reverse

With the sprocket planet gear (6) held by the lever (2), the sun gear (5) again turns in the normal direction forcing the spool planet gear against the spool drive gear (3). The spool is driven but the sprocket remains free. (This is the normal film winding mode.)

Film Travel →

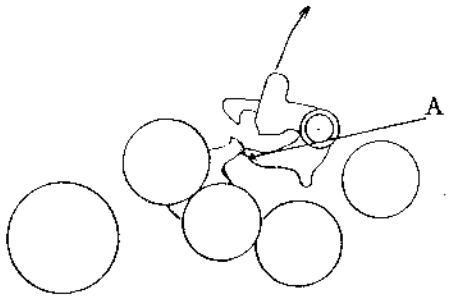



Film Transport

Film Rewind

At the end of the film, the motor reverses for about 20ms pulling the spool planet gear away from the spool gear, freeing the spool. The motor then stops and rewinding is completed by the rewind motor. Then the motor turns in the normal direction to prepare for the next loading cycle.

When the back cover is opened, the the release lever unlatches the hold lever from the planet arm by spring tension. As the latch on the hold lever releases, the "A" portion of the lever holds the planet arm to prevent outside forces from engaging the sprocket planet gear with the sprocket gear so the sprocket remains free for the start of the next loading cycle.



3. Mirror Mechanism

Unlike earlier mirror which used a spring-powered lever to raise the mirror, the EOS cameras use a motor to quickly and smoothly raise the mirror.

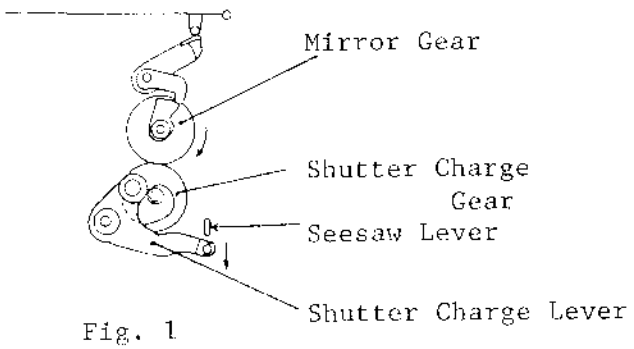



Fig. 1

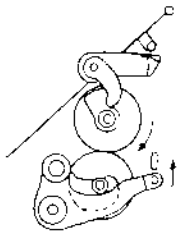
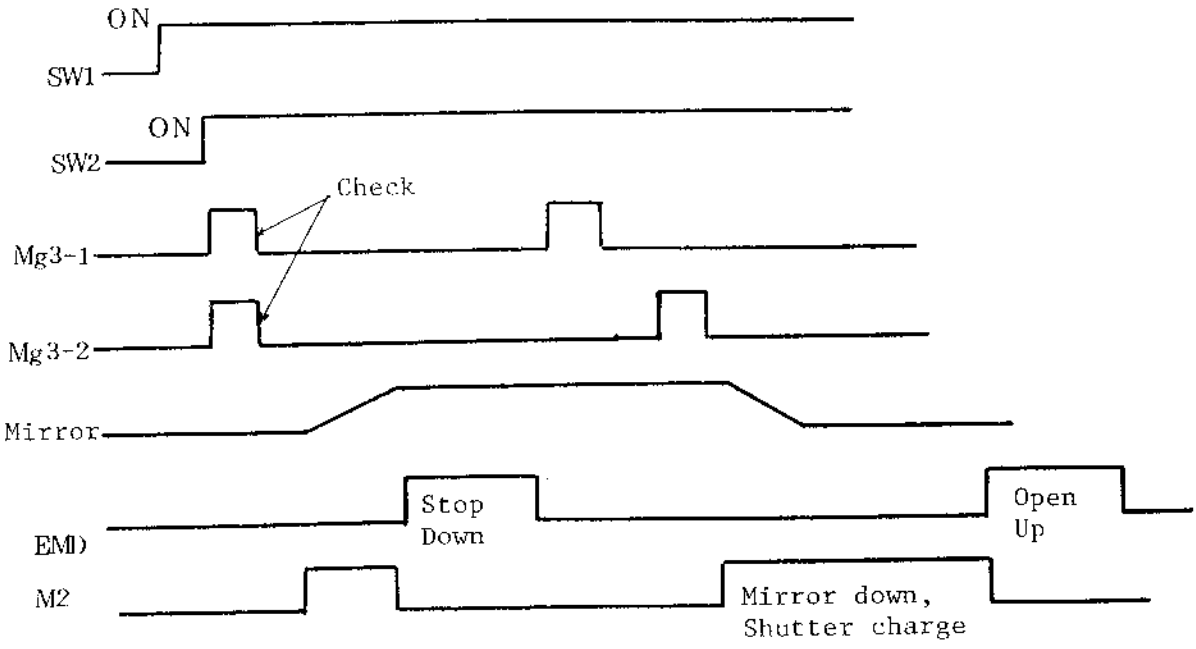
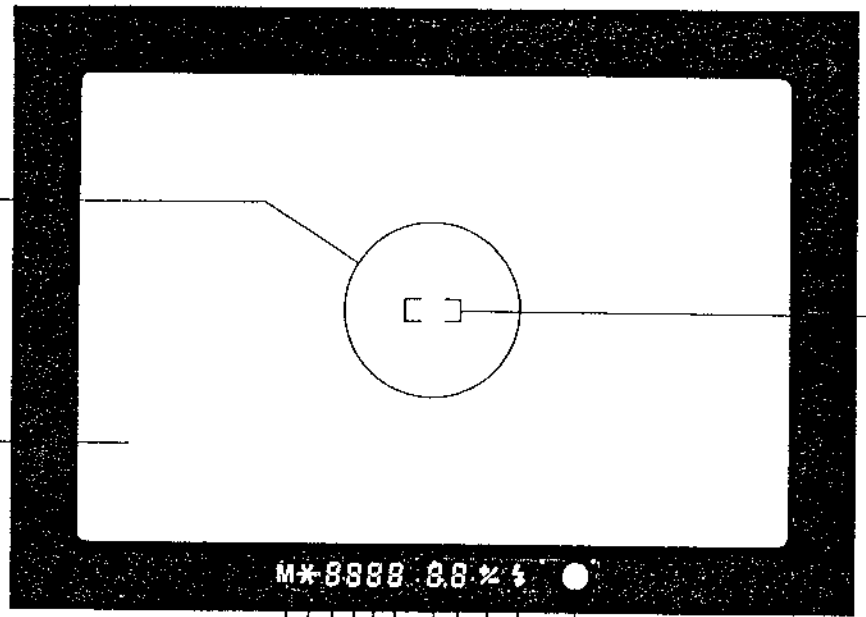


Fig. 2

When the shutter button is pressed halfway (SW1), autofocus and exposure metering is performed. When the release switch (SW2) goes on, the motor (M2) (which does double duty as the rewind motor) turns driving the shutter charge gear and mirror gear through the worm gear. This rapidly and smoothly raises the mirror (Fig. 1). The mirror up position is sensed switch formed by the micro-brush on the back of the shutter charge gear and the pattern on the shutter sensor circuit board. When the mirror is up, the signal is sent to the main processor (IC-4) which in turn sends the stop-down signal to the lens to set the predetermined aperture. The shutter then fires. The 2nd curtain signal starts the motor again driving the mirror down and charging the shutter. When the shutter is charged, the aperture drive (EMD) is activated to open the diaphragm. When the diaphragm is fully open, the winding motor (M1) is turned on winding the film.






Partial metering range mark

New laser-matte screen

AF frame (1.0 x 2.5 mm)
*About 0.33% of viewfinder screen

Manual exposure indicator

Partial metering indicator
(lights when partial metering button pressed)
(AE lock)

☐Shutter speed indicator

( ||| ) dEP 1, dEP 2 indicator

☐Aperture value indicator

Exposure compensation indicator

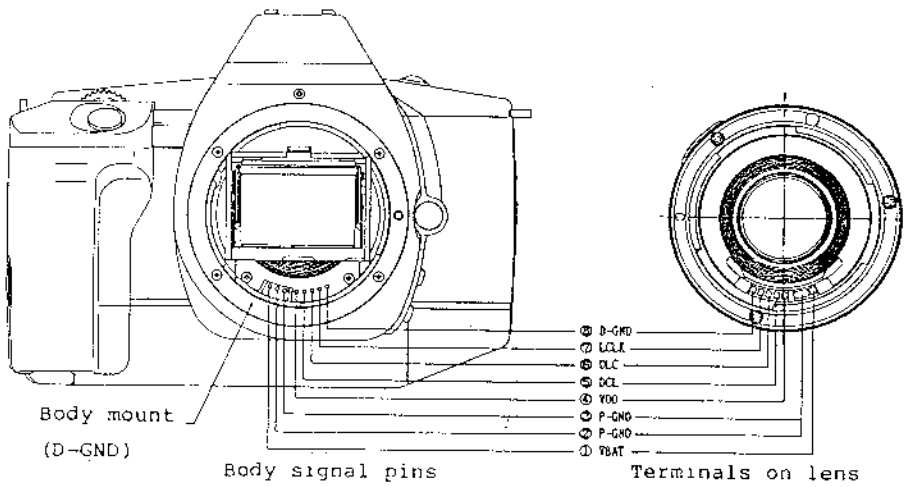
Flash charge completion indicator

☐AF in-focus mark
*Lights when AF focusing completed, flashes at 8 Hz when AF ranging is not possible.

*With manual focusing, lights when subject is in focus (Focusing Aid indicator does not light when subject not in focus.

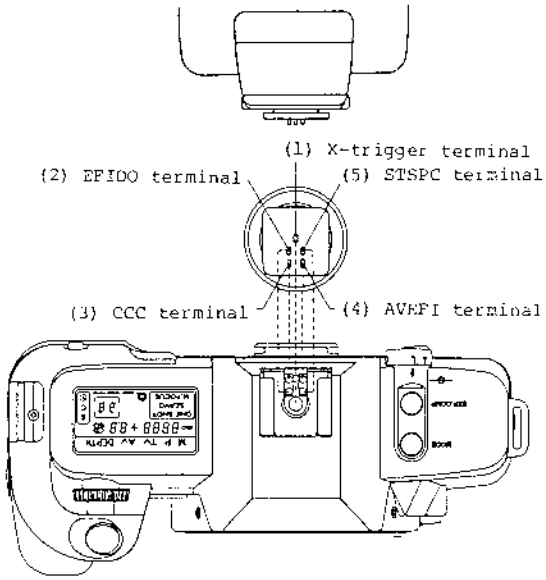
*Indicators marked ☐ either light steadily or flash; other indicators only light steadily. When exposure is outside of coupling range, indicator flashes at 2 Hz.

[1]-Fig.-2 Electronic mount signals




| | |
|---|---|
| Diameter of contact surface | ø54 mm |
| Outside diameter | ø65 mm |
| Lens mounting rotation angle | 60° |
| Flange back | 44 mm |
| Signal transfer | All-electronic signal transfer through 8 contacts |
| Signals | (1) VBAT (AFD-USM, EMD drive power supply)<br>(2) P-GND (VBAT ground)<br>(3) P-GND (VBAT ground)<br>(4) VDD (Power supply for IC and peripheral circuits in lens)<br>(5) DCL (data from camera to lens)<br>(6) DLC (Data from lens to camera)<br>(7) LCLK (Data transfer clock)<br>(8) D-GND (VDD ground) |
| Material | Stainless steel |

[1]-Fig.-3 Terminals of direct flash contacts




| Terminal name | Function |
|---|---|
| (1)X-trigger terminal | X contact/flash trigger |
| (2)EFIDO terminal | Sync TV range determination in the flash auto mode |
| (3)CCC terminal | Automatic setting of sync shutter speed |
| (4)AVEFI terminal | Automatic setting of flash aperture |
| (5)STSPC terminal | Start/stop flash (preflash and main) |

## 6. EOS Evaluative Metering

### 6-1 Operational Theory

The EOS system divides metering into three areas: center area, a band around the center area, and the rest of the field of view.

The system meters luminance in each of these areas, then analyzes the levels and their distribution to determine the subject size and type of scene (normal, backlit, dark background, black subject, etc.). Proper exposure is then determined for these conditions using a specially developed formula.

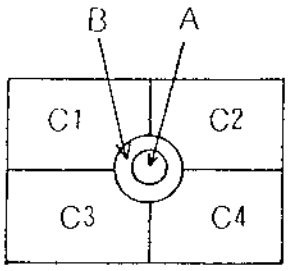
Naturally, since different areas are being measured, the exposure values will be diferent between central area metering and evaluative metering even with the same main subject. This is true at all brigntnesses, and especially so at high brightnesses where a 0.5EV correction factor is built in to prevent underexposure of the central subject.

### 6-2 Service Considerations

As stated above, the two metering systems give different readings at all brightnesses because they are reading different areas. In the shop using an EV tester, exposure below EV 15 (EV9 and EV12) will be the same because the same brightness is applied to all areas of the screen. But at EV15, the EV tester will indicate a error of +0.5EV. The reason can be seen from the formula below.

$$\frac{(C1 + C2 + C3 + C4)}{4} = C \text{ (average)}$$

C: The weight assigned C depends on the average brightness (BV) on C




If C is less than BV14 (ISO 100)* :

$$EV = \frac{A + B + 2C}{4}$$

IF C is BV14 or greater

$$EV = \frac{A + B + 2(14)}{4}$$

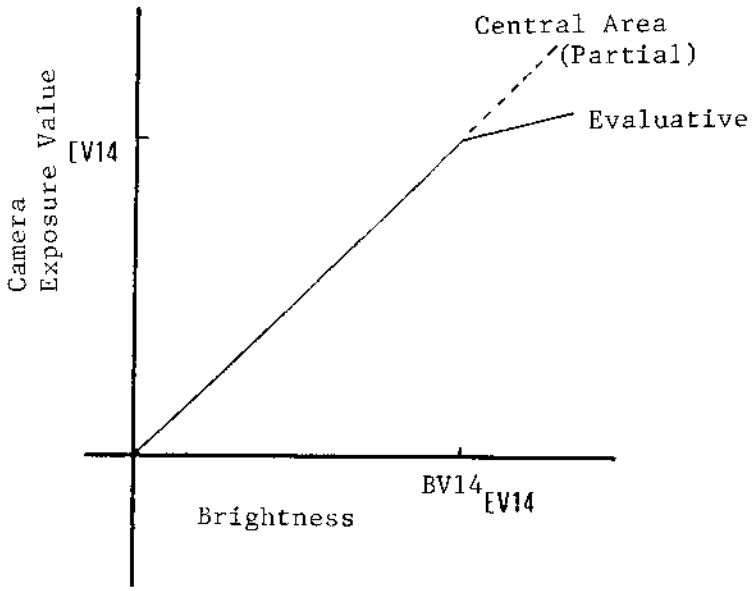
Central area metering utilizes segment A. At EV14 or lower, the reading with central area and evaluative metering with a uniform brightness will be the same,but this is not true at EV 15 (or higher).

EX: BV = 15
A = B = 15

$$\frac{15 + 15 + 2(14)}{4} = 14.5$$

With central area metering the result will be EV15, but with evaluative metering the result will be EV14.5 and the camera will indicate 0.5EV overexposure. THIS IS CORRECT EXPOSURE.

Do not adjust to make the EV Tester read $\pm$ 0EV.



# IV EOS ELECTRICAL DESCRIPTION

The organization of EOS electrical description:

(1) Electrical Parts and Signals
(2) Block Diagram
(3) Circuit Explanation
(4) Check Point

## (1) Electrical Parts and Signals

The explanation of electrical parts and signals, which are described in block diagram, circuit diagram and pattern diagram, is described.

## (2) Block Diagram

The input circuit and output circuit of EOS camera is explained. Moreover, the organization of information processing circuit, which connects the input circuit with the output circuit, is explained.
The input circuit includes the detection circuit of operation switch, the DX film readout circuit, the optical-measuring circuit for detecting the light from object, the light intensity adjustment circuit and the range measuring circuit.
The output circuit includes the LCD panel, the internal LCD of view finder, the LED for indicating focus matching, the LED for lighting, the LED for self timer, the magnet for shutter, the motor for winding film and the motor for shutter charge.

## (3) Circuit Explanation

The explanation of main circuit is described.

## (4) Check Point

The points, which can be checked by using tester and oscilloscope, are described. Moreover, the items, which can be diagnosed by checking each point, is explained.

(1) Electrical Parts and Signals

| Symbol | Type Name | Use |
|---|---|---|
| LCD1 | | LCD display panel |
| LCD2 | | Internal LCD of finder |
| AFLED | | LED for indicating focus matching |
| AELED | | LED for lighting the internal LCD of view finder |
| SELFLED | | LED for self timer |
| Mg3 - 1 | | 1st curtain magnet |
| Mg3 - 2 | | 2nd curtain magnet |
| M1 | | Motor for winding film |
| M2 | | Motor for charging shutter |
| IC1 | T8124F | Used for measuring light |
| IC2 | T8123 | Used for adjusting light |
| IC3 | SN28898 | Used for driving LCD and detecting switch operation |
| IC4 | MC68HC11 | CPU |
| IC5 | T1749F | Lens, speed write |
| | | Buffer for TBE, DX code |
| IC6 | SN102878 | Used for driving range measuring sensor |
| IC7 | LC4016 | Range measuring sensor |
| IC8 | MPC1710 | Used for driving M1 |
| IC9 | MPC1710 | Used for driving M2 |
| IC10 | SFX10 | Used for supplying power to lens |
| IC11 | | Used for constant voltage |
| IC12 | MN128 | Used for reset |
| Tr1 | HS514 | Used for driving Mg3-1 |
| Tr2 | HS514 | Used for driving Mg3-2 |
| D1 | MA151A | Used for protection |
| D2 | MA151A | Used for protection |
| D3 | MA151A | Used for protection |
| D4 | MA153A | Used for protection |
| D5 | MA151WK | Used for protection |
| D6 | 1S2095 | Used for protection |
| DZ1 | STZ6 | Used for protection |
| DZ2 | STZ6 | Used for protection |
| Xtal | 32KHZ | |

| Symbol | Note |
|---|---|
| FF1 | Film phase 1 |
| FF2 | Film phase 2 |
| SF1 | Shutter phase 1 |
| SF2 | Shutter phase 2 |
| CN2 | 2nd curtain switch |
| RES1 | Reset switch |
| SW1 | Light measuring switch |
| SW2 | Shutter switch |
| SW3 | Camera mode switch |
| SW4 | Rewind switch |
| SW5 | AF mode switch |
| SW6 | Delivery mode switch |
| SW7 | Battery check switch |
| SW8 | Exposure compensation switch |
| SW9 | Cartridge switch (It is open when film is attached.) |
| SW10 | Main switch 1 |
| SW11 | Main switch 2 |
| SW12 | Buzzer switch |
| SW13 | Rear cover switch (It is open when rear cover is closed.) |
| SW14 | Lens switch |
| SW15 | Depth of field cheek switch |
| SW16 | Manual aperture set switch |
| SW17 | LCD 2 light switch |
| SW18 | Partially light measuring switch |
| SW19 | Dial switch 2 |
| SW20 | Dial switch 1 |

| Symbol | Note | | Connection |
|---|---|---|---|
| C1 | 0.1uF C | Used for smoothing | IC1 |
| C2 | 0.1uF C | Used for smoothing | IC1 |
| C3 | 6.8uF T | Used for smoothing | IC1 |
| C4 | 220PF C | Used for smoothing | IC2 |
| C5 | 1uF T | Used for smoothing | IC2 |
| C6 | 6.8uF T | Used for smoothing | IC2 |
| C7 | 0.01uF C | Used for smoothing | IC3 |
| C8 | 10PF C | Used for smoothing | IC3 |
| C9 | 0.1uF C | Used for smoothing | IC3 |
| C10 | 0.1uF C | Used for smoothing | IC3 |
| C11 | 0.1uF C | Used for smoothing | IC3 |
| C12 | 0.1uF C | Used for smoothing | IC3 |
| C13 | 0.1uF C | Used for smoothing | IC3 |
| C14 | 6.8uF T | Used for smoothing | IC3 |
| C15 | 6.8uF T | Used for smoothing | IC4 |
| C16 | 6.8uF T | Used for smoothing | IC4 |
| C17 | 0.1uF C | Used for smoothing | IC5 |
| C18 | 2.2uF T | Used for smoothing | IC5 |
| C19 | 6.8uF T | Used for smoothing | IC5 |
| C20 | 6.8uF T | Used for smoothing | IC6 |
| C21 | 4.7uF T | Used for smoothing | IC6 |
| C22 | 6.8uF T | Used for smoothing | IC6 |
| C23 | 0.1uF C | Used for smoothing | IC6 |
| C24 | 0.1uF C | Used for smoothing | IC6 |
| C25 | 1uF T | Used for smoothing | IC7 |
| C26 | 0.1uF C | Used for smoothing | IC8 |
| C27 | 0.1uF C | Used for smoothing | IC8 |
| C28 | 0.1uF C | Used for smoothing | IC8 |
| C29 | 0.1uF C | Used for smoothing | IC9 |
| C30 | 0.1uF C | Used for smoothing | IC9 |
| C31 | 0.1uF C | Used for smoothing | IC9 |

| Resistor | Note | | Connection |
|---|---|---|---|
| RTC | | | IC1 |
| R1 | 10KOHM | 1/8w | IC3 |
| R2 | 30KOHM | 1/8w | IC4 |
| R3 | 51KOHM | 1/8w | IC4 |
| R4 | 51KOHM | 1/8w | IC4 |
| R5 | 51KOHM | 1/8w | IC4 |
| R6 | 51KOHM | 1/8w | IC4 |
| R7 | 4.7KOHM | 1/8w | IC4 |
| R8 | 30KOHM | 1/8w | IC4 |
| R9 | 51KOHM | 1/8w | IC4 |
| R10 | 12.1KOHM | 1/8w | IC5 |
| R11 | 11KOHM | 1/8w | IC5 |
| R12 | 15.4KOHM | 1/8w | IC5 |
| R13 | 12.1KOHM | 1/8w | IC5 |
| R14 | 51KOHM | 1/8w | Tr1 |
| R15 | 51KOHM | 1/8w | Tr2 |
| R16 | 1.2KOHM | 1/8w | Tr1 |
| R17 | 1.2KOHM | 1/8w | Tr2 |

| Coil | Note | |
|---|---|---|
| L1 | 180UH | Used for smoothing |
| L2 | 180UH | Used for smoothing |

| Electrical Signals | Explanation |
|---|---|
| SIC3 | Used for selecting the objection communicating with IC4. |
| SIC5A | Same above. |
| SIC5B | Same above. |
| SIC5C | Same above. |
| SIC6 | Same above. |
| SCLK | Clock signal. |
| DMS | Data transferred from IC4. |
| DSM | Data transferred to IC4. |
| LCLK | Clock signal. |
| DCL | Data transferred to lens. |
| DLC | Data transferred from lens. |
| BLCK | Clock signal. |
| DCB | Signal transferred to TBE . |
| DBC | Signal transferred from TBE. |
| TV | Signal relating to speedlite. |
| AV | Same above. |
| STSP | Same above. |
| EFID | Same above. |
| ADIC5 | Analog signal transferred from IC5 to IC4. |
| ADIC6A | Analog signal 1 transferred from IC6 to IC4. |
| ADIC6B | Analog signal 2 transferred from IC6 to IC4. |
| LEDF1 | Luminance signal 1 of LED. |
| LEDF2 | Luminance signal 2 of LED. |
| S0 | Change 0 of light measuring distribution. |
| S1 | Change 1 of light measuring distribution. |
| S2 | Change 2 of light measuring distribution. |
| AEOUT | Output of light measuring. |
| FEOUT | Output of light measuring. |

| Electrical Signals | Explanation |
|---|---|
| TTLST | L level during light adjustment. |
| DAOUT | Compensation of light adjustment. |
| BASIS1 | Drive 1 of BASIS. |
| BASIS2 | Drive 2 of BASIS. |
| TINT | L level during BASIS storage. |
| M1R | Drive of M1. |
| M1F | Drive of M1. |
| M2R | Drive of M2. |
| M2F | Drive of M2. |
| F1 --- F11 | Drive of BASIS. |
| VIDEO | Video signal. |
| VIDMAX | Video signal (Maximum). |
| VIDMIN | Video signal (Minimum). |
| DX1 | DX code. |
| DX2 | Same above. |
| DX3 | Same above. |
| DX4 | Same above. |
| DX5 | Same above. |
| RES1 | Reset switch signal. |
| RES2 | Reset signal of IC4, IC5 and IC6. |
| IRQ | L level when reset switch turn from OFF to ON. |

| Electrical Signals | Explanation |
|---|---|
| E1ON | DC/DC ON when it is L level. |
| TRAP | L level when E1 of IC5 is H level. |
| PWR | L level when battery is empty. |
| VBAT | 6V |
| E1 | 5V |
| E2 | 5V |
| E3 | 3V |
| EM | -5V |
| VDD | 5.5V |
| VC | 1.22V |
| VRH | 3.2V |
| COM1 -3 | Common signal. |
| SEG1 - 26 | Segment signal. |

(2) Block Diagram

(2-1) Operation swith

Operation switches (SW1 --- SW20) are entered in IC3.
SW2 is entered in IC4.

(2-2) DX film

DX code is entered in IC5.

(2-3) Light of object

Light entered in IC1 is used for measuring light.
Light entered in IC2 is used for adjusting light.
Light entered in IC7 is used for measuring range (length).

(2-4) LCD1 and LCD2

LCD1 and LCD2 are driven by IC3.

(2-5) LED

AFLED, AELED and SELFLED are driven by IC5.

(2-6) Shutter

Shutter is driven by the output (Mg3-1 and Mg3-2) of IC4.
IC4 checks shutter operation by switch CN2 which interlocks with 2nd curtain.

(2-7) Film wind

IC4 drives motor (M1) with the signals of M1R and M1F to wind film.
It detects film position by the switches of FF1 and FF2 which interlocks with sprocket wheel.

(2-8) Mirror and shutter charges

IC4 drives motor (M1) with the signals of M1R and M1F to drive mirror and charge shutter.
IC4 detects the situation of mirror and shutter charges by shutter phase switches (SF1 and SF2).

(2-9) Film rewind

IC4 reverses motor (M2) with the signals of FF1 and FF2 to rewind film.

IC4 detects the situation of film rewind by film phase switches of SF1 and SF2 which interlock with sprocket wheel as described in (2-7) film wind.

(2-10) Information communication

IC4 selects the object of communication by the signals of SIC3, SIC5A, SIC5B, SIC5C and SIC6.

IC4, synchronizing to the clock signal of SCLK, transfers the data of IC4 to the object of communication by the output DMS.

IC4, synchronizing to the clock signal of SCLK, reads the data from the object of communication by the input DSM.

(2-11) Light measurement

IC1 changes the distribution of light measurement by the signals of S0, S1 and S3 transferred from IC4.

Then, it transfers the output of light measurement (AEOUT) to IC5.

IC5 informs IC4 of the information of AFOUT by ADIC5.

(2-12) Light adjustment

IC2 measures the light of speedlite by the output (DAOUT and TTLST) of IC5, then inform IC5 of the measured data by the output of FE out. IC5 sets the signal (STSP), which is transferred to stroboscope, to H when FEOUT reaches a reference value. Then, IC5 stops luminescence.

(2-13) Range measurement

IC6 outputs the signals (F1 -- F11), which drive IC7, by the signals of BASIS1 and BASIS2 transferred from IC4.

IC7 outputs the signals (VIDEO, VIDMAX and VIDMIN), which are secondary coupled image of object, to IC6 by the signals (F1 -- F11) of IC6.

IC6 outputs the signal of ADIC6, which the signal of VIDEO is amplified, to IC4.

(3) Circuit explanation

(3-1) Circuit operation when battery is set.

When battery is set, circuit operates as shown below, then stops its operation.

A VBAT, VDD supplying power
B IC3 reset.

(3-2) Circuit operation when grip is installed.

When grip is installed, circuit operates as shown below, then stops its operation.

C Reset switch OFF
D DC/DC ON
E IC4, IC5, IC6 reset
F Communication between IC4 and IC3.
G Set the data of IC4.
F Communication between IC4 and IC3.
Z DC/DC OFF

(3-3) Circuit operation when turn the main switch on.

When you turn the main switch on, circuit operates as shown below, then stops its operation.

D DC/DC ON
E IC4, IC5, IC6 reset
F Communication between IC4 and IC3.
H Control of LED.
K Communication with lens.
L Communication with TBE .
M Communication with speedlite.
Z DC/DC OFF

(3-4) Circuit operation when battery switch is ON.

When you turn battery switch on, circuit operates as shown below, then stops its operation.

D DC/DC ON
E IC4, IC5, IC6 reset
F Communication between IC4 and IC3.

I Battery check.
H Control of LED.
K Communication with lens.
L Communication with TBE.
M Communication with speedlite .
Z DC/DC OFF

(3-5) Circuit operation when film is attached.
When film is attached, circuit operates as shown below, stops its operation.

D DC/DC ON
E IC4, IC5, IC6 reset
F Communication between IC4 and IC3.
H Control of LED.
K Communication with lens.
L Communication with TBE.
M Communication with speedlite .
N Readout of DX code.
O Wind of film.
H Control of LED.
K Communication with lens.
L Communication with TBE .
M Communication with speedlite .
Y Store in IC4
Z DC/DC OFF

(3-6) Circuit operation when turn the SW1 on.

When you turn the SW1 on, circuit operates as shown below.

D DC/DC ON

E IC4, IC5, IC6 reset

F Communication between IC4 and IC3.

H Control of LED.

K Communication with lens.

L Communication with TBE .

M Communication with speedlite .

Q Light measurement.

M Communication with speedlite.

L Communication with TBE .

R Range measurement.

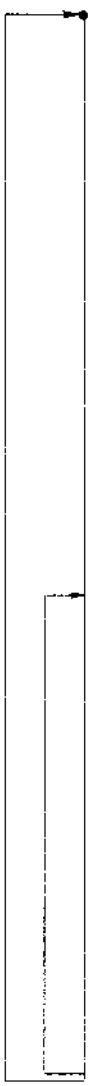
K Communication with lens.

H Control of LED.

Repeat F, H, K, L, M, Q, M, L, R, K, H.

(3-7) Circuit operation when turn the SW2 on.

When you turn the SW2 on, circuit operates as shown below.



M Communication with speedlite.
K Communication with lens.
S Mirror up.
K Communication with lens.
L Communication with TBE.
M Communication with speedlite.
T Control of shutter.
U Light adjustment.
J Shutter charge.
K Communication with lens.
O Wind of film.
K Communication with lens.
F Communication between IC4 and IC3.
H Communication with LED.
K Communication with lens.
L Communication with TBE.
M Communication with speedlite.
Q Light measurement.
M Communication with speedlite.
L Communication with TBE.
R Range measurement.
K Communication with lens.
H Control of LED.

Repeat F, H, K, L, M, Q, M, L, R, K, H.

When take a photograph continuously, repeat M, K, S, K, L, M, T, U, J, K, O, K, F, H, K, L, M, Q, M, L, R, K, H.

(3-8) Circuit operation when turn the SW1 and SW2 off.

When you turn the SW1 and SW2 off, circuit operates as shown below, then stops its operation.

Y Store in IC4.
Z DC/DC OFF.

(3-9) Circuit operation when film is consumed.

When film is consumed, circuit operates as shown below, then stops its operation.

- P Rewind of film.
- F Communication between IC4 and IC3.
- H Control of LED.
- K Communication with lens.
- L Communication with TBE.
- M Communication with speedlite.
- Z DC/DC OFF

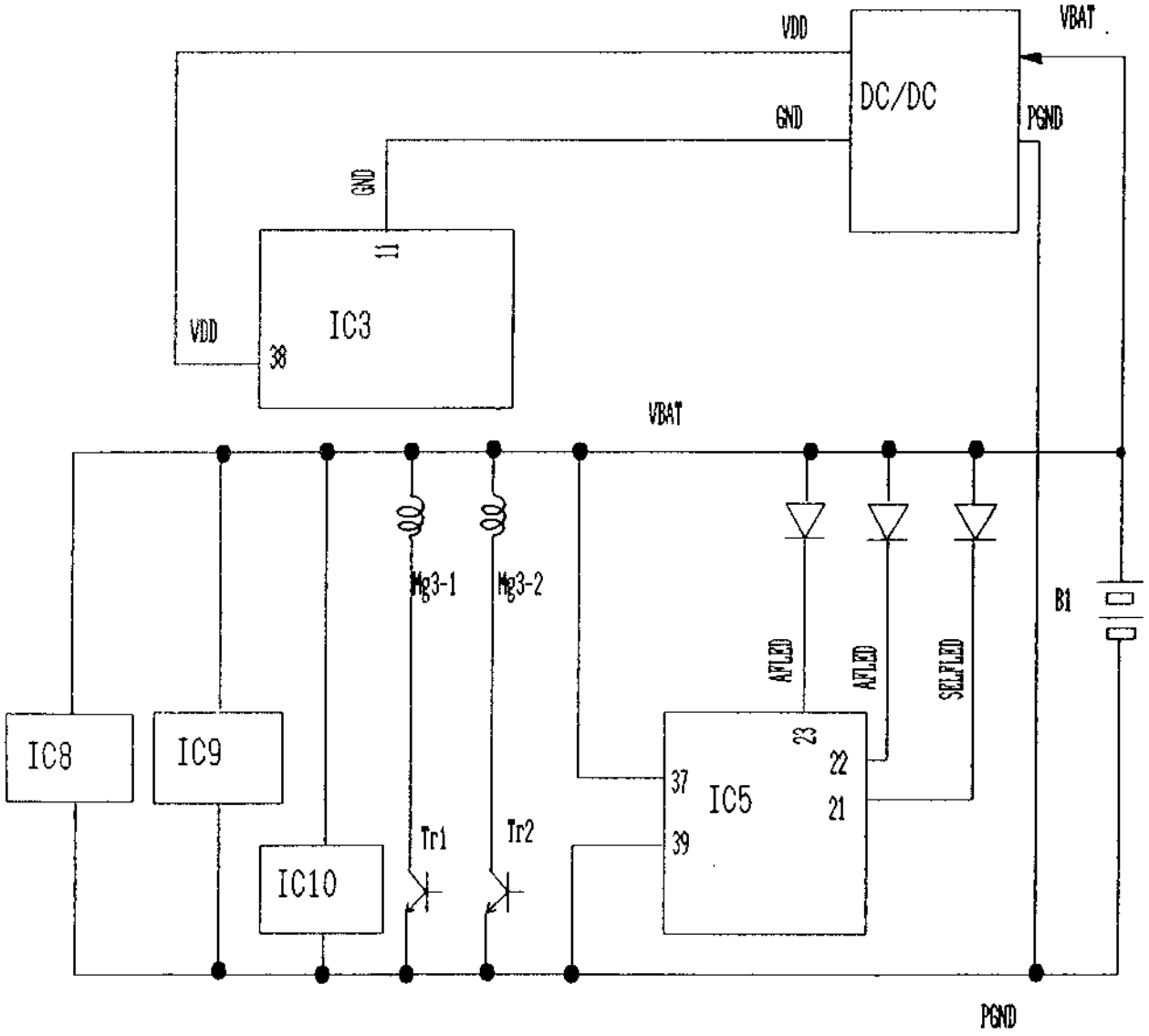
(3-10) Circuit operation when grip is removed.

When grip is removed, circuit operates as shown below, then stops its operation.

- Y Store in IC4.
- Z DC/DC OFF

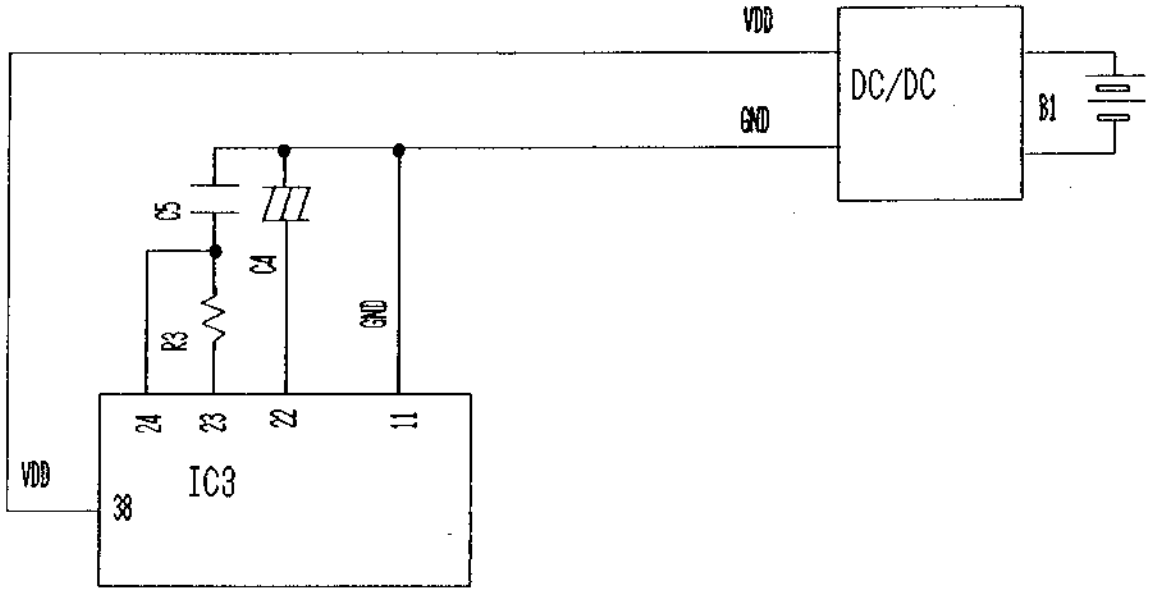
A VBAT, VDD supplying power

When battery is setting, VBAT is 6V. And VDD, supplied the power through the diode in DC/DC converter, is 5.5V.
The voltage of VBAT is applied to IC5, IC8, IC9, IC10, Mg3-1, Mg3-2, AFLED, AELED and SELFLED. The voltage of VDD is applied to IC3.



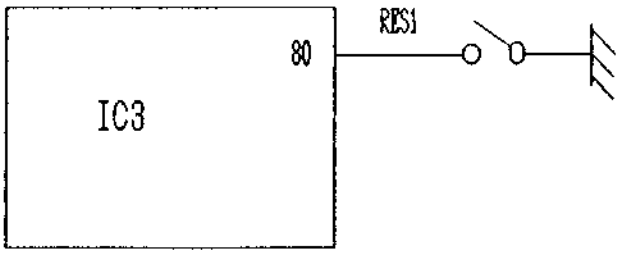
B IC3 reset

When the voltage of VDD is applied to IC3, IC3 is reset by condenser C4, C5 and resistor R3.




C Reset switch OFF

When you install grip, RES1 turns off and camera turns to operation state.



D DC/DC ON

When the switches (RES1, SW1 -- SW20) for inputting into IC3 are opened and closed, the output (E1ON) of IC3 turns to L level and DC/DC converter begins operation. Then, E1 is set to 5V and EM is set to -5V.

The voltage of EM is smoothed through coil L2 and condenser C33, then supplied to IC6 and IC7.

The voltage of E1 supplied to IC4 and IC5.

The voltage of E1 is regulated to E2 through coil L1 and condenser C32, then supplied to IC1, IC2, IC5 and IC6.

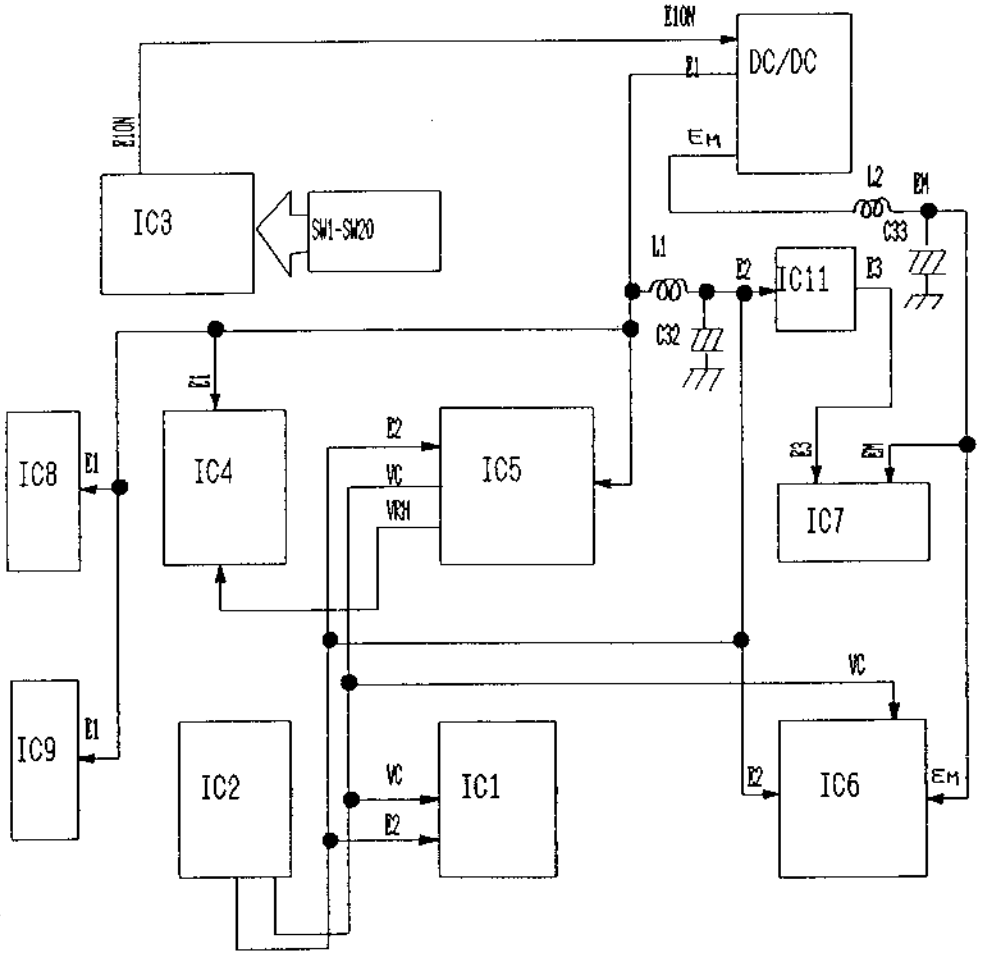
IC5, to which E2 is supplied, outputs the low voltage output of VC=1.22V and the VRH=3.5V.

The low voltage output (VC) is applied to IC1, IC2 and IC6.

The VRH is applied to IC4.

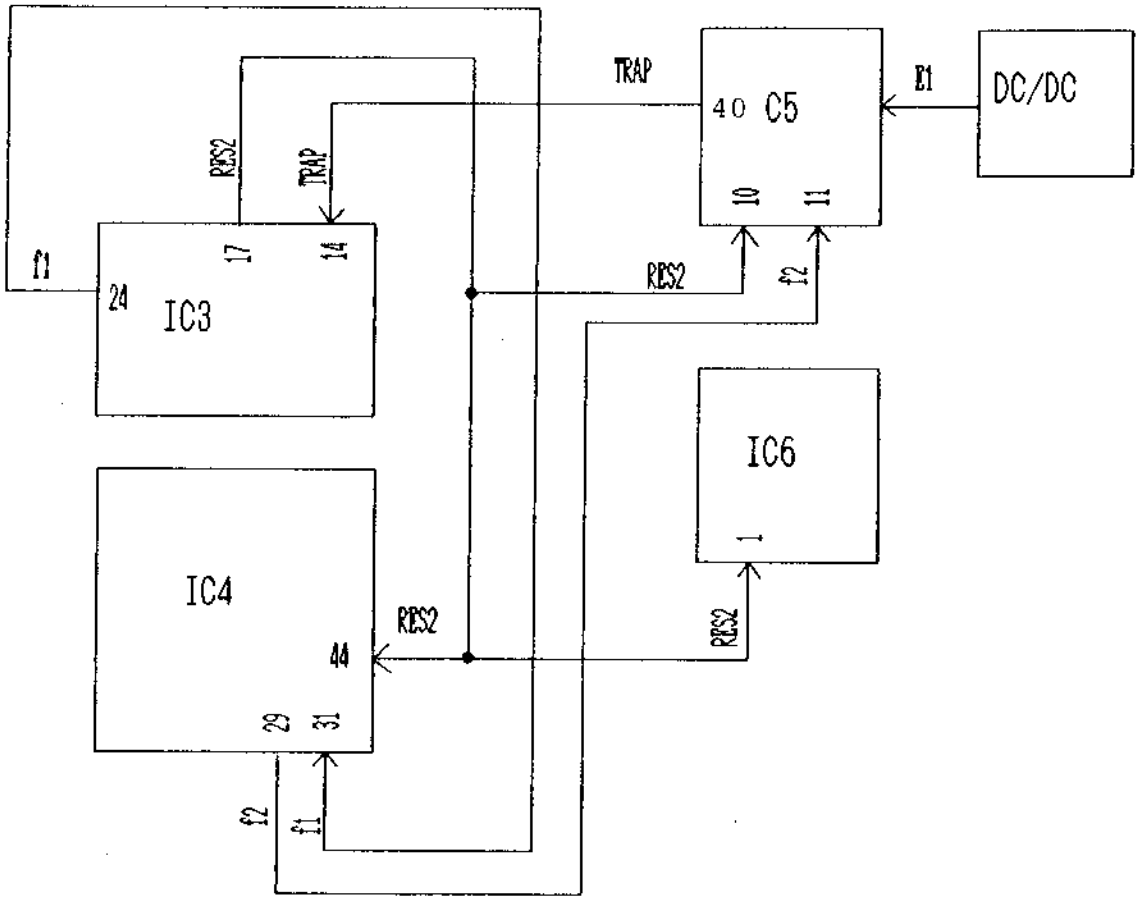
When DC/DC converter is operating, the current of battery is about 200 mA.

The voltage of E3, generated by IC11, is supplied to IC7.



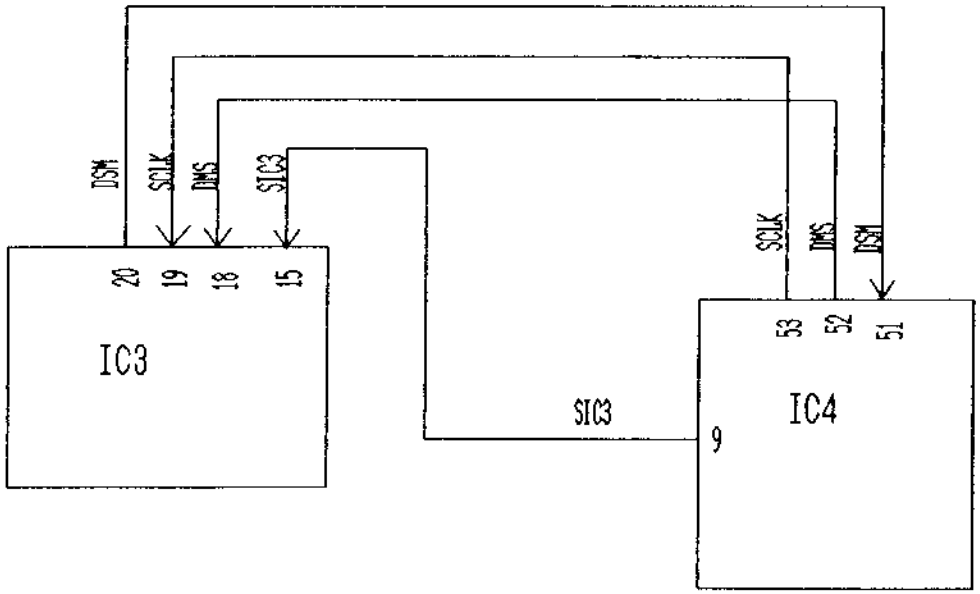
E IC4, IC5, IC6 reset

When 5V output voltage (E1) of DC/DC converter is supplied to IC5, the output TRAP of IC5, turning to L level, is applied to IC3.
Then, the output RES2 of IC3, turning to L level, reset IC4, IC5 and IC6.
IC3 transfers clock signal (f1) to IC4 in order to drive IC4 and IC4 transfers clock signal (f2) to IC5 in order to drive IC5.



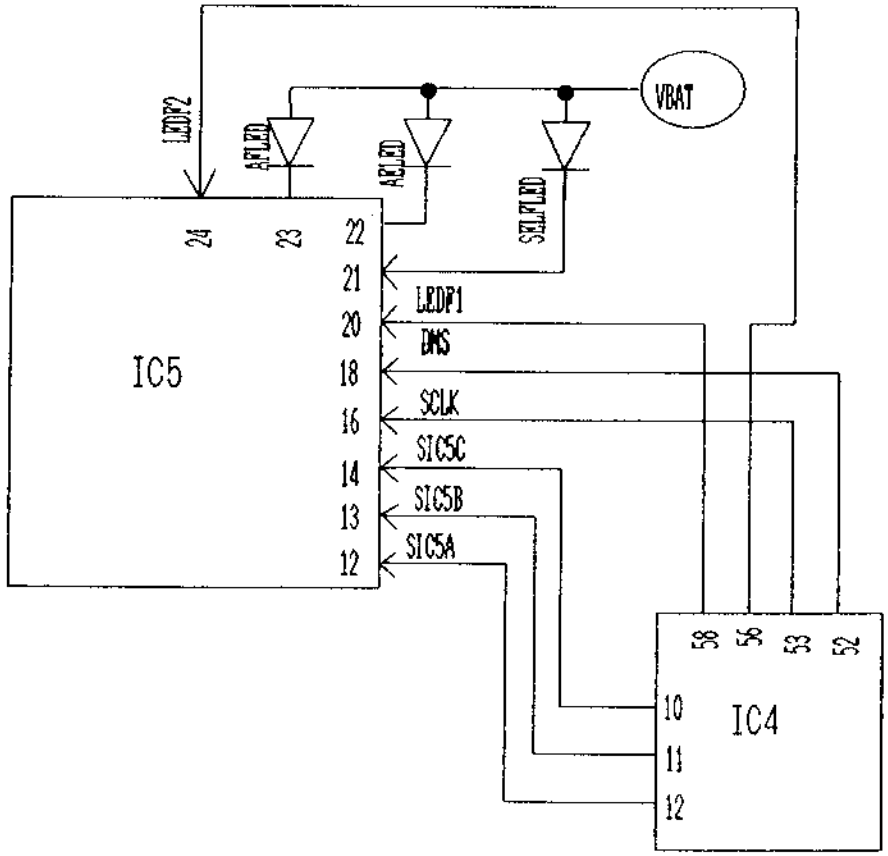
F Communication between IC4 and IC3

IC3 and IC4 are communicated when SIC3 is H level.
The data of SCLK (clock signal) and DMS are transferred serially from IC4.
The data of SCLK (clock signal) and DSM are transferred serially from IC3.



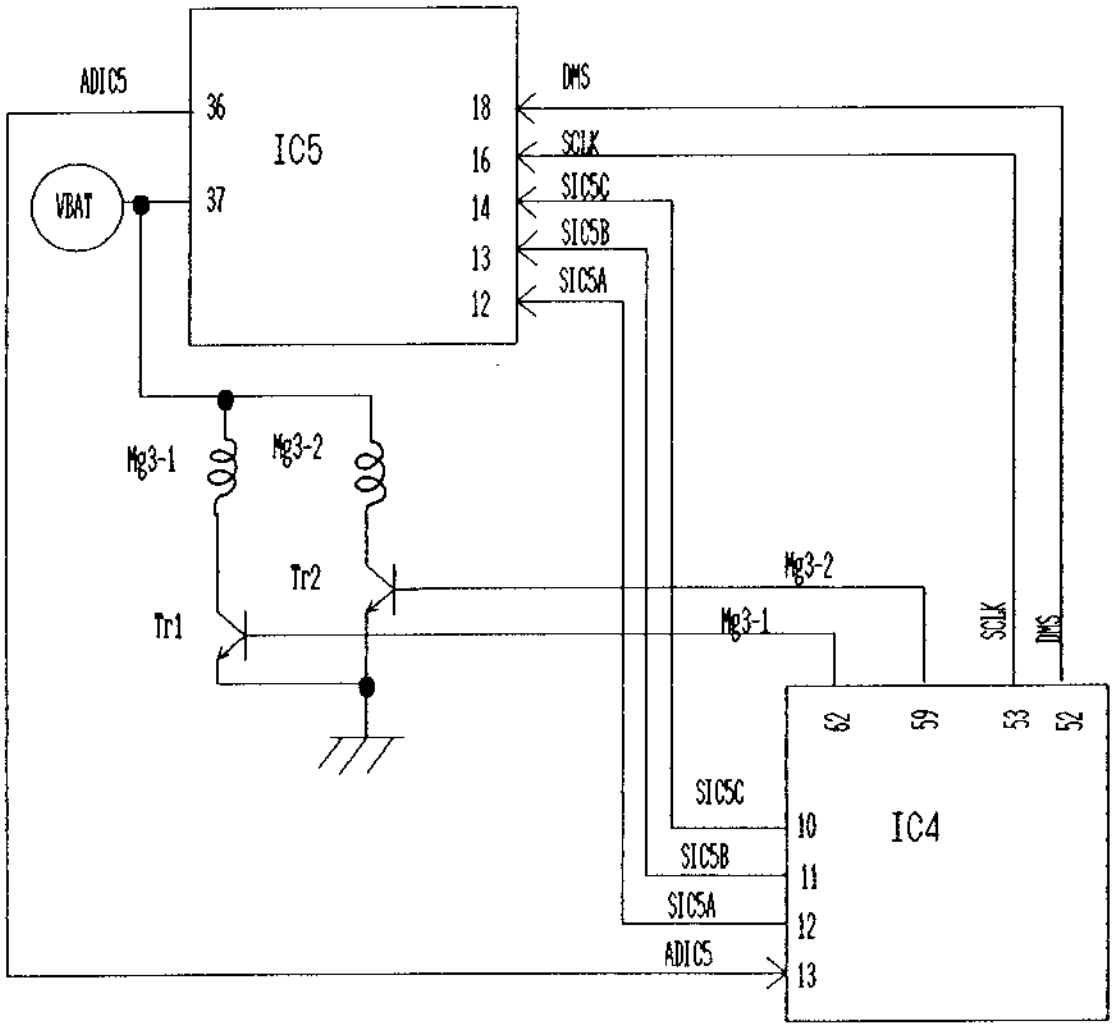
H Control of LED

AFLED, AELED and SELFLED are lighted on according to the combination with SIC5A, SIC5B and SIC5C, and the contents of SCLK (clock signal) and DSM data serially transferred from IC4. Brightness is controlled according to the LEDF1 and LEDF2 of IC5.



I Battery check

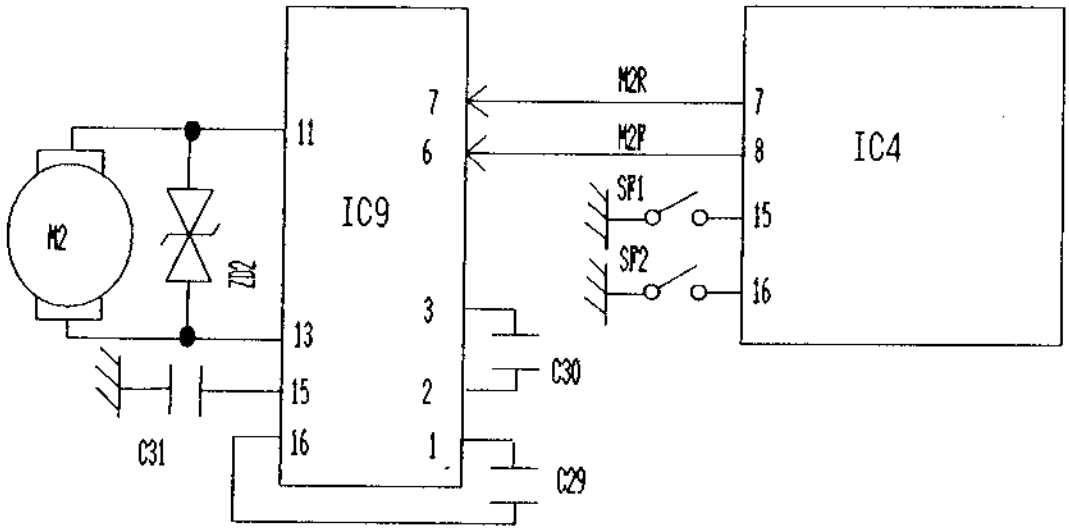
IC4 drives Mg3-1 and Mg3-2 and detects the voltage of VBAT by receiving ADIC5 from IC5.
IC5, processing based on SIC5A, SIC5B, SIC5C, SCLK and DMS, transfers the voltage of VBAT from ADIC5.

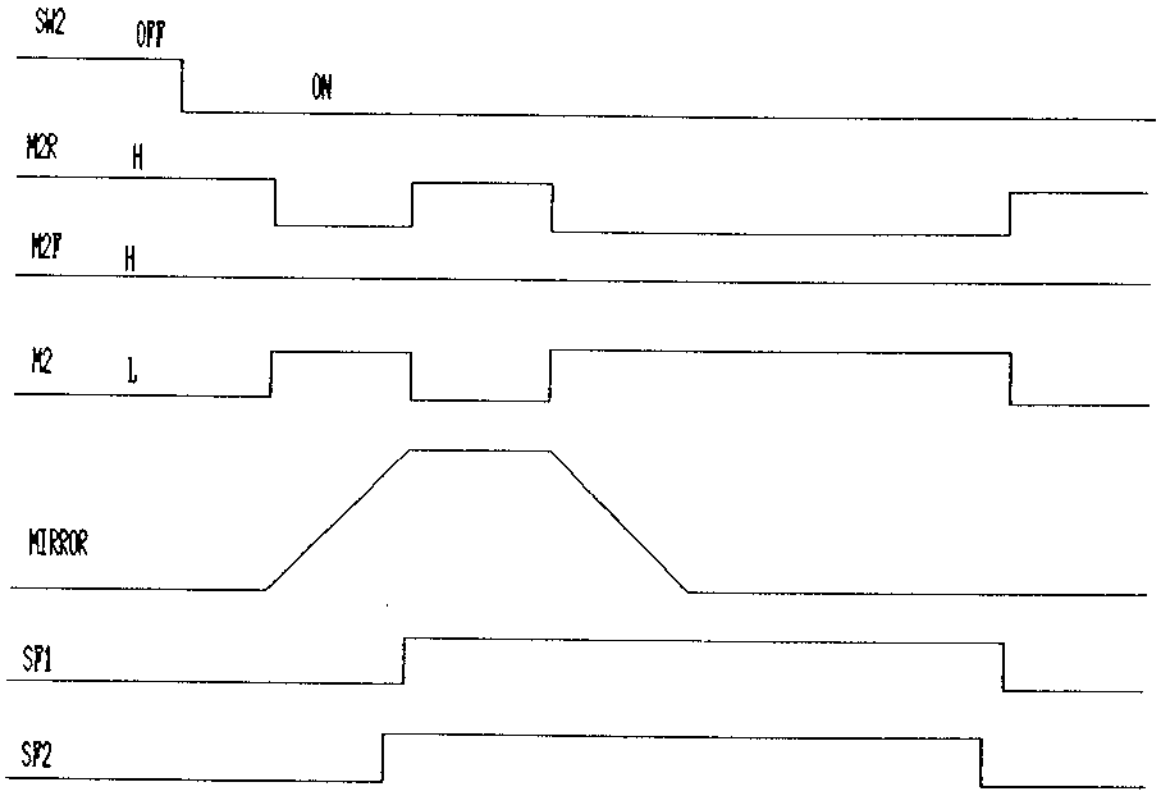


J Mirror down and shutter charge

IC4 and IC9 drive motor M2 to execute mirror down and shutter charge.

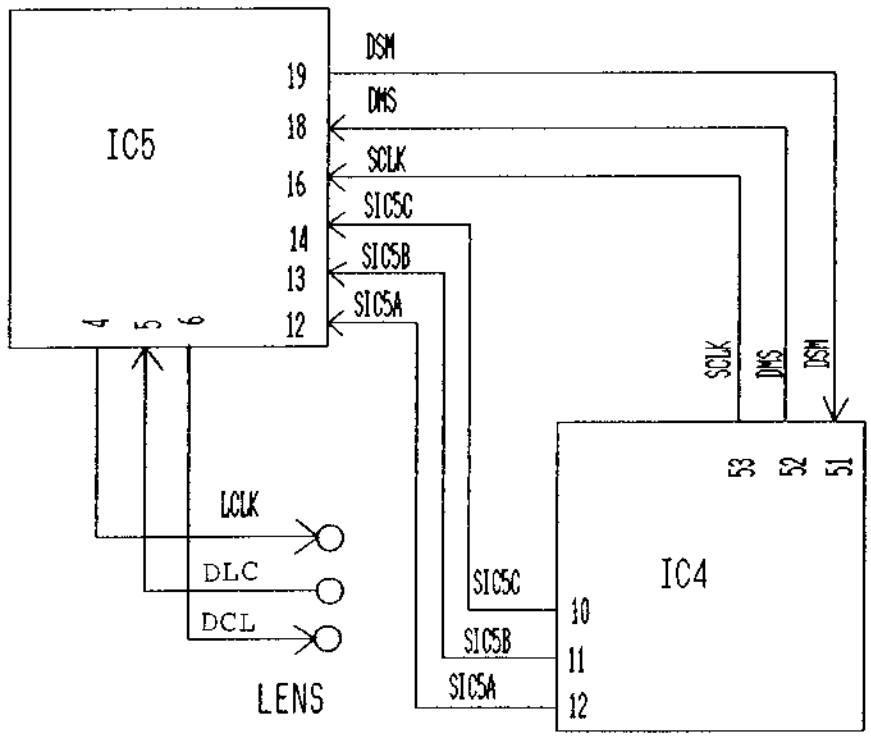
SF1 and SF2 are opened or closed according to shutter charge phase.



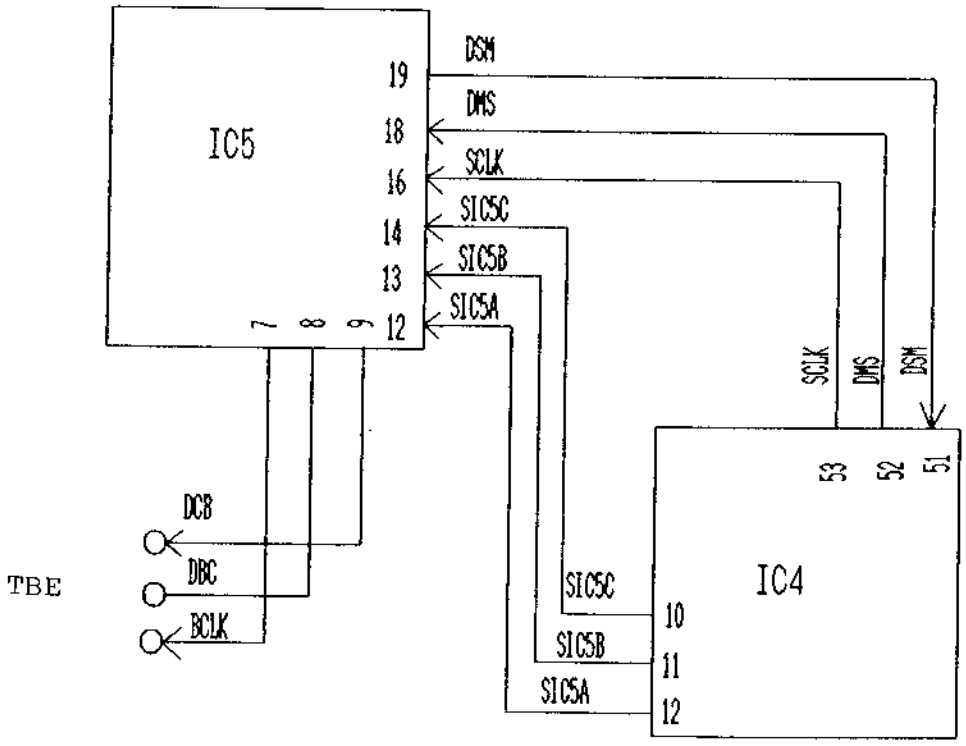
K Communication with lens

When the outputs of IC4 are in the state such as SIC5C = H, SIC5B = L and SIC5A = L, IC5 can communicate with lens.



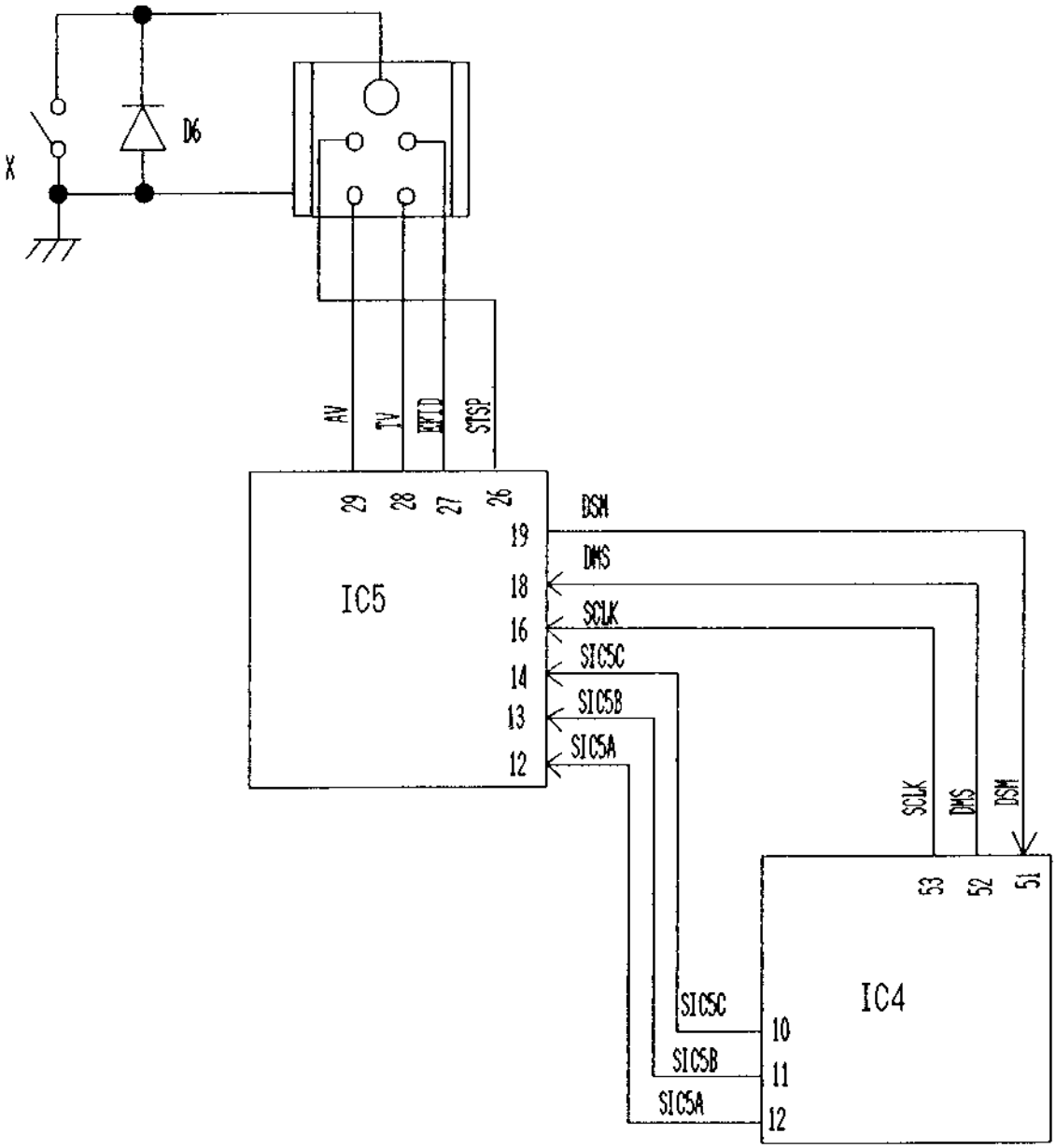
L Communication with TBE

When the outputs of IC4 are in the state such as SIC5C = L, SIC5B = H and SIC5A = L, IC5 can communicate with TBE.



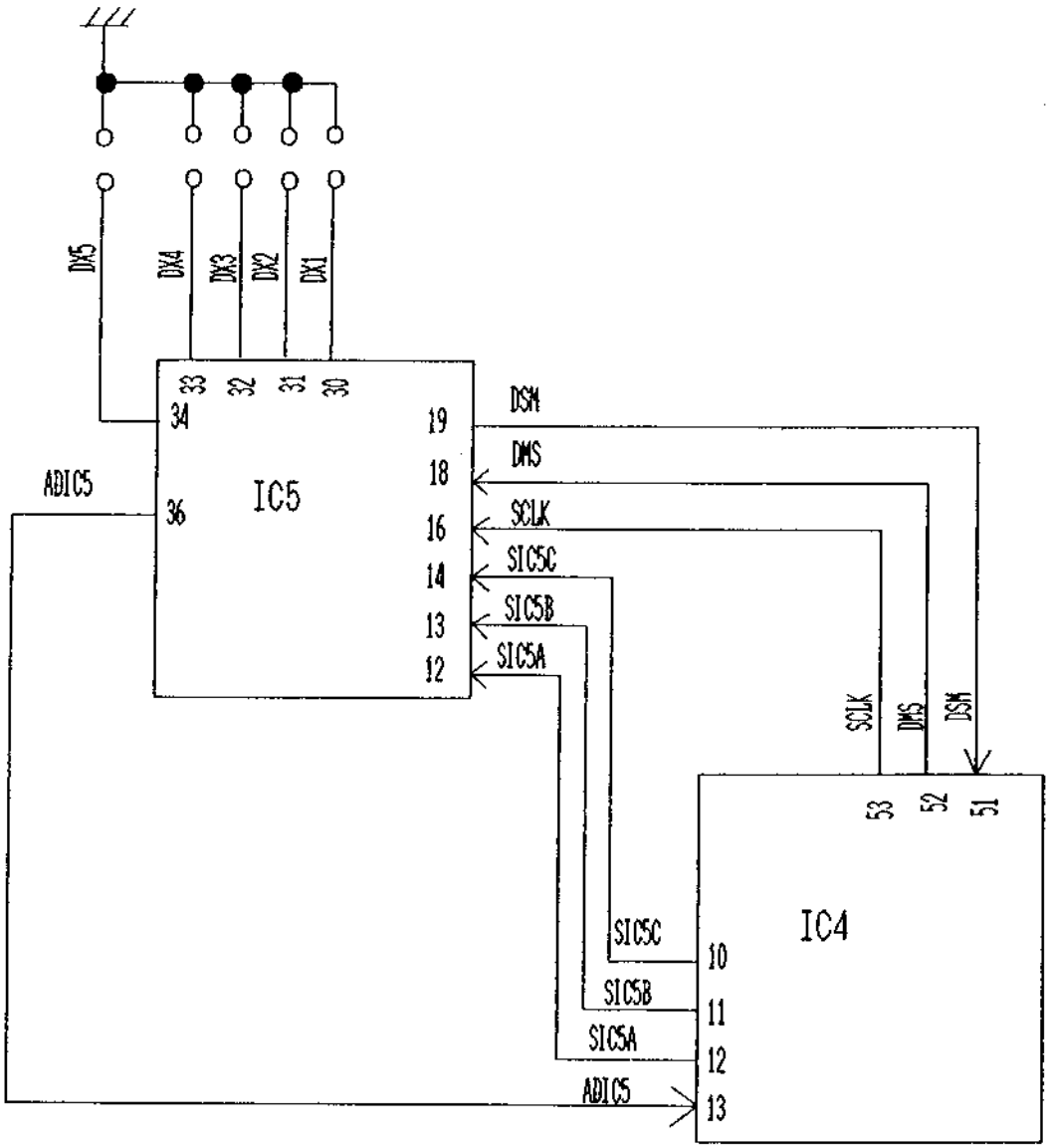
M Communication with speedlite

When the outputs of IC4 are in the state such as SIC5C = L, SIC5B = H and SIC5A = H, IC5 can communicate with speedlite .



N Readout of DX code

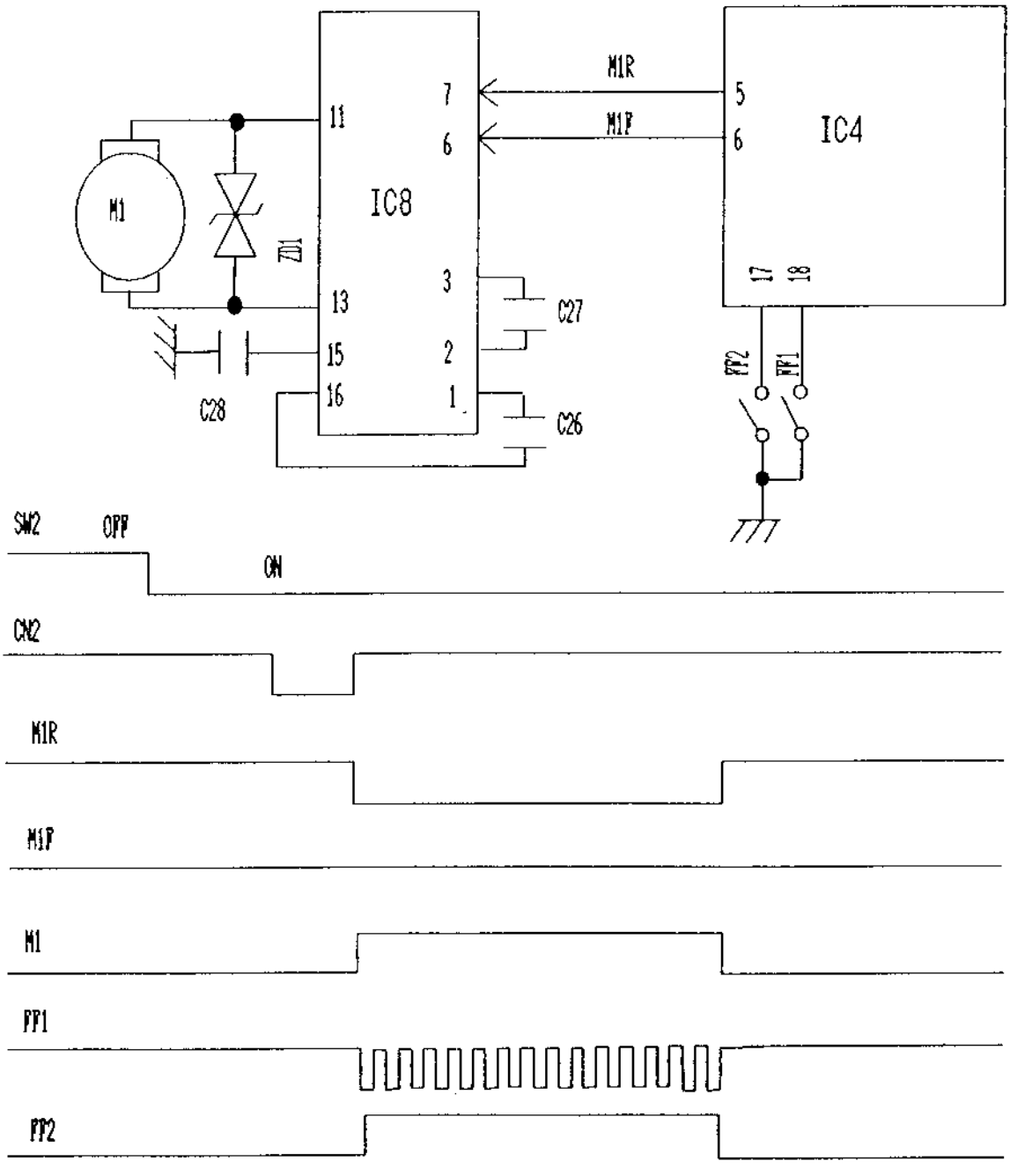
When the outputs of IC4 are in the state such as SIC5C = H, SIC5B = H and SIC5A = L, IC4, transferring the data to IC5 through SCLK and DMS, can read DX code by serially receiving the DX1 - DX5 data from the ADIC5 of IC5.



O Wind of film

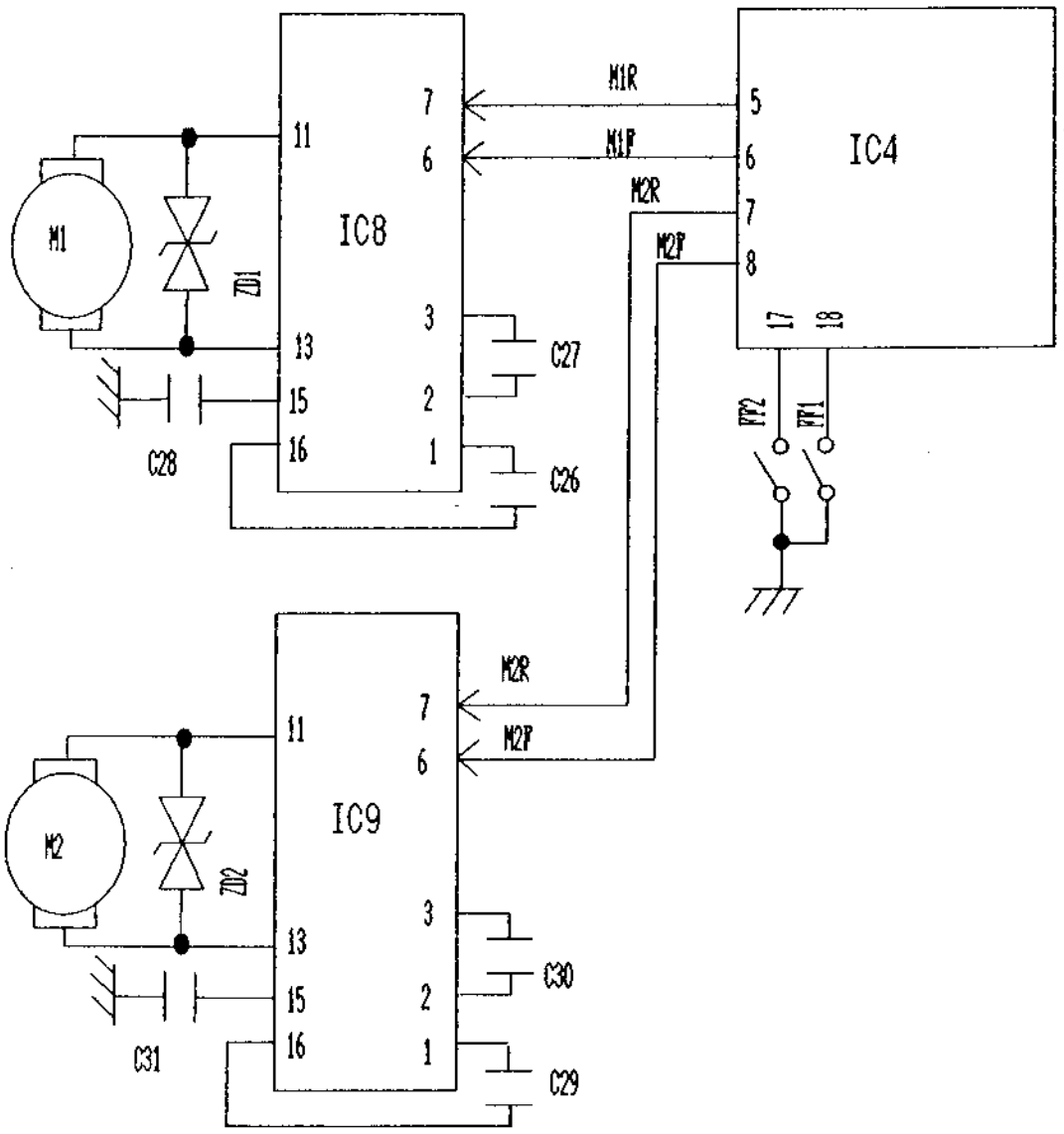
IC4 and IC8 drive motor M1 to wind film.

FF1 and FF2, interlocking to sprocket wheel, detect film phase.



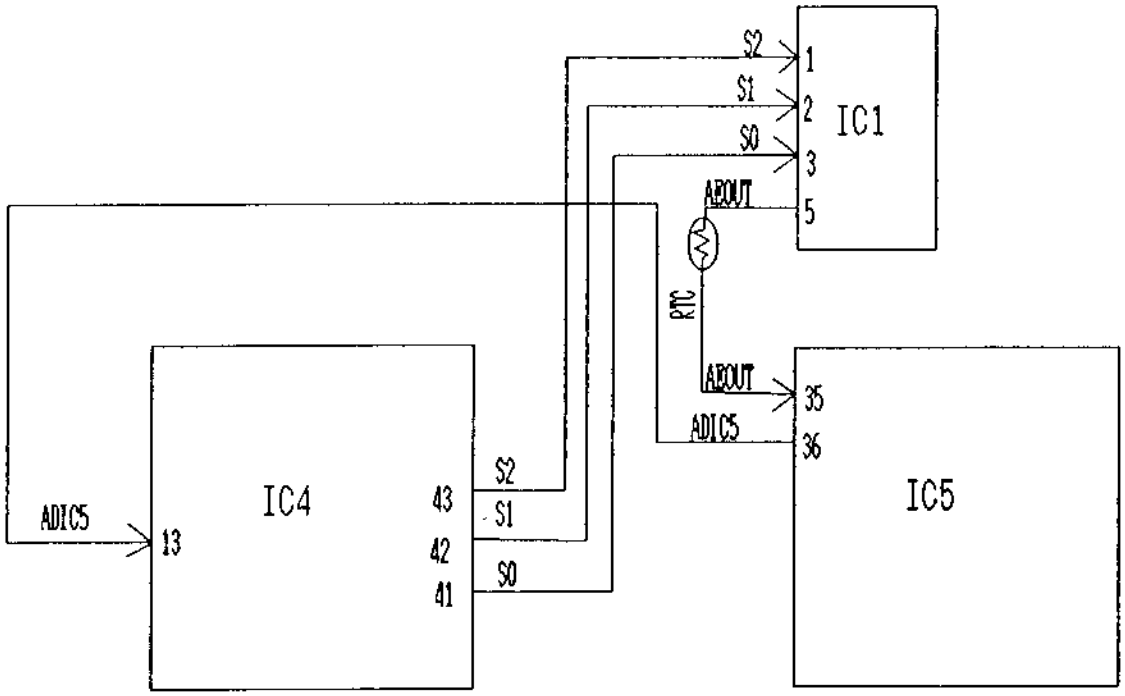
P Film rewind

Film can be rewound as follows. IC4 and IC8 reverse motor M1 to drive planet wheel gear, then IC4 and IC9 reverse motor M2 which is interlocked to rewind gear in order to rewind film.



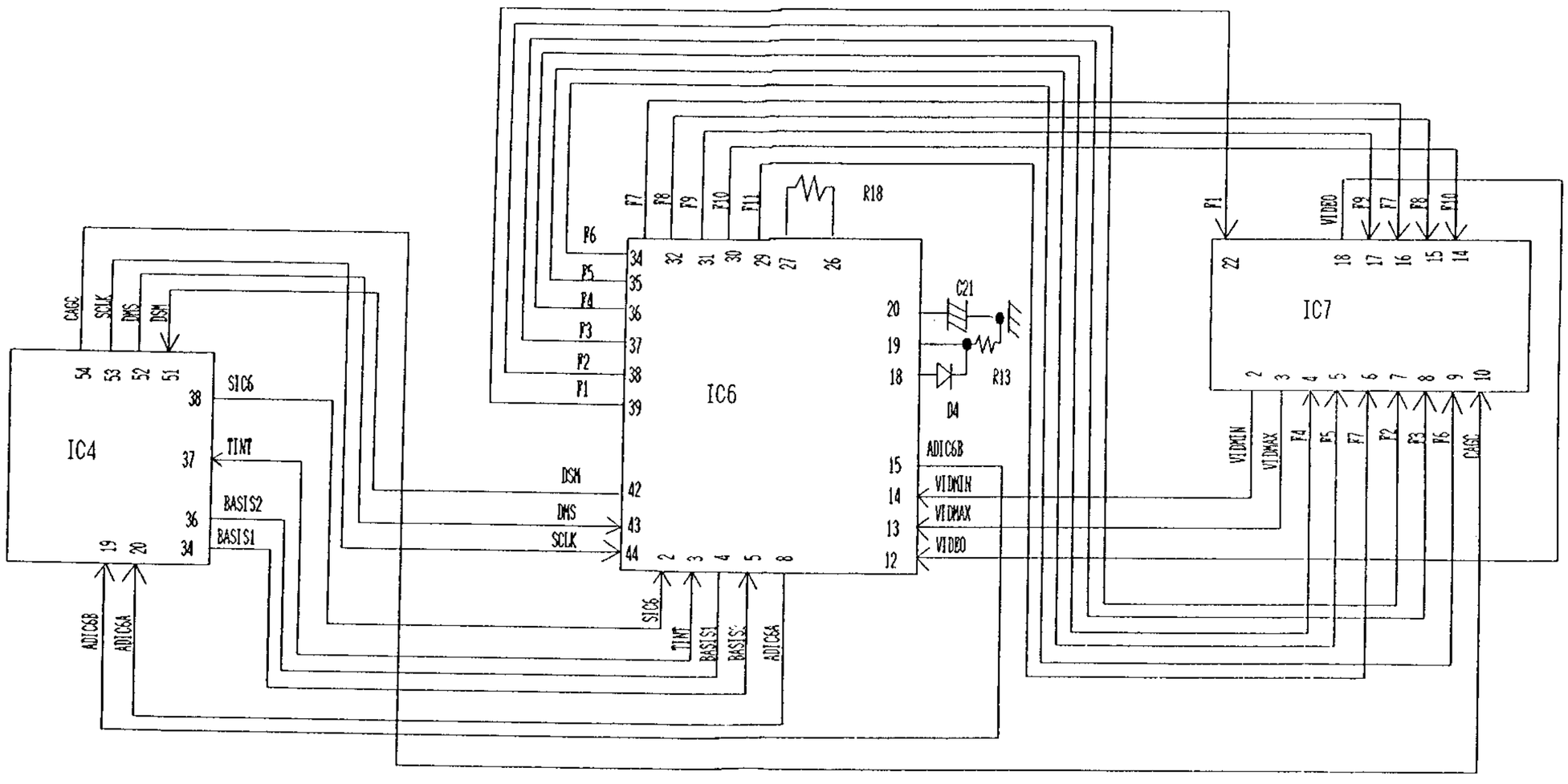
Q Light measurement

IC4, transferring the combination signal of S0, S1 and S2, selects the light measuring device.
IC1 transfers the output signal of AEOUT to IC5, then IC5 transfers it to IC4 through ADIC5.



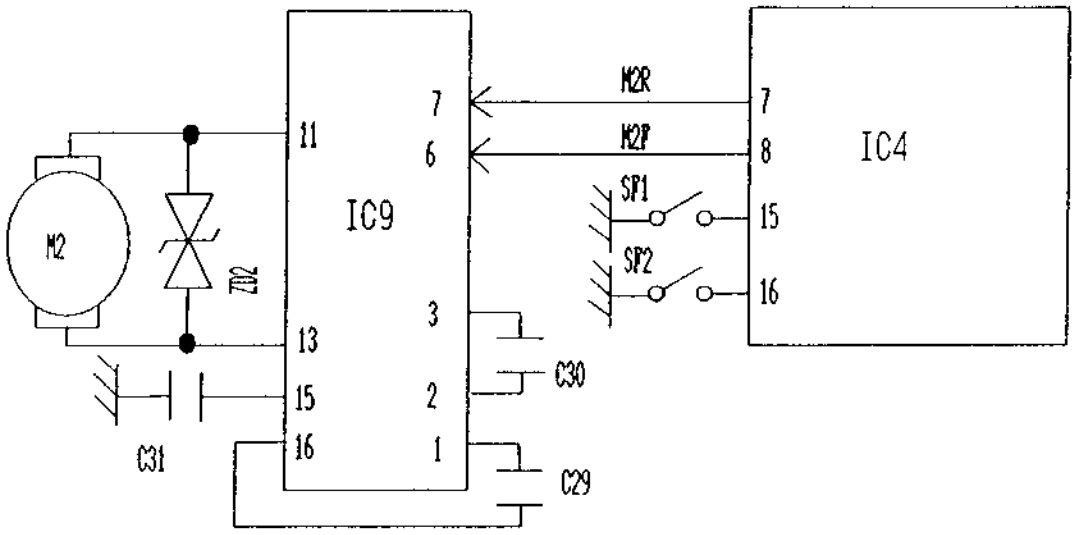
R Range measurement

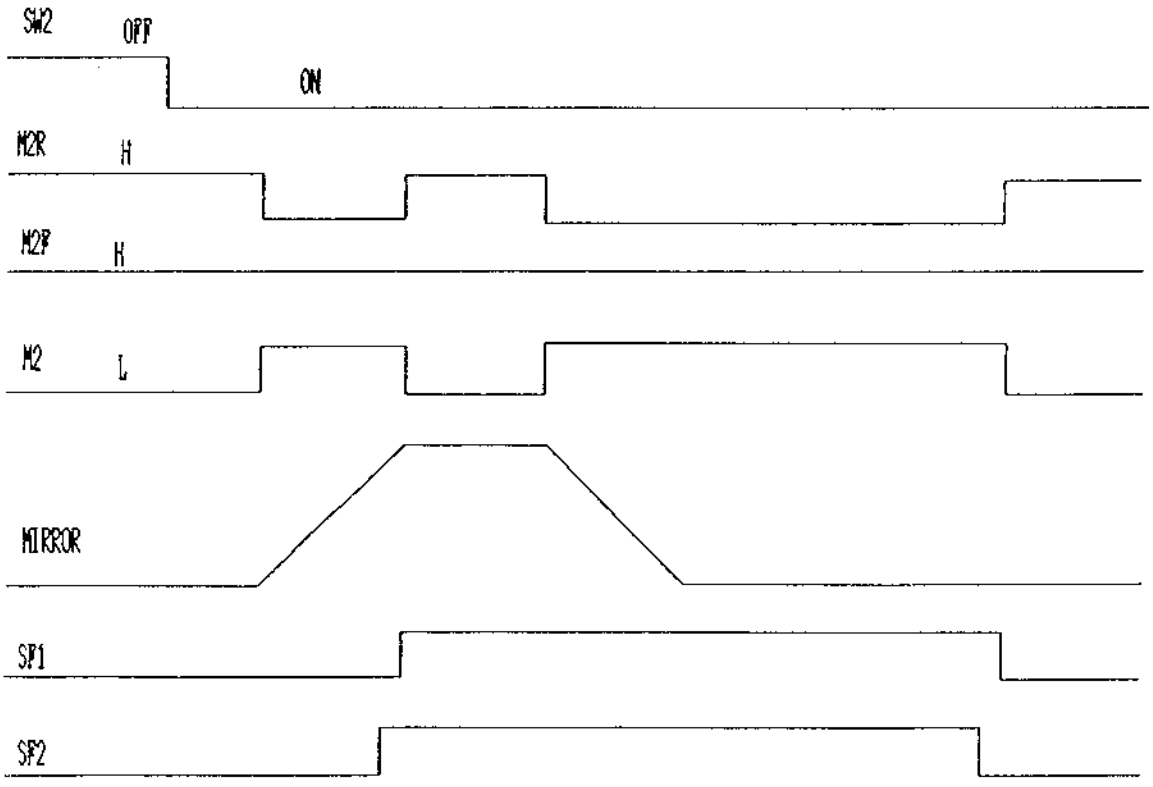
IC4 directs IC6 to initiate range measurement through SCLK and DMS.
IC4 outputs BASIS1 and BASIS2.
IC6 generates the signals (F1 - F11) for driving IC7 according to the output signals (BASIS1 and BASIS2) of IC4.
IC7, driven by the outputs signals (F1 - F11) of IC6, outputs the signals (VIDEO, VIDMAX and VIDMIN) of range measurement image.
When VIDMAX reaches a reference value, IC6 stores image signal in IC7 with the outputs (F1 - F11) and turns TINT to L level in order to inform IC4 of the completion of storage.
IC6 generates ADIC6A and ADIC6B according to VIDEO and VIDMIN, then outputs them to IC4.



S Mirror up

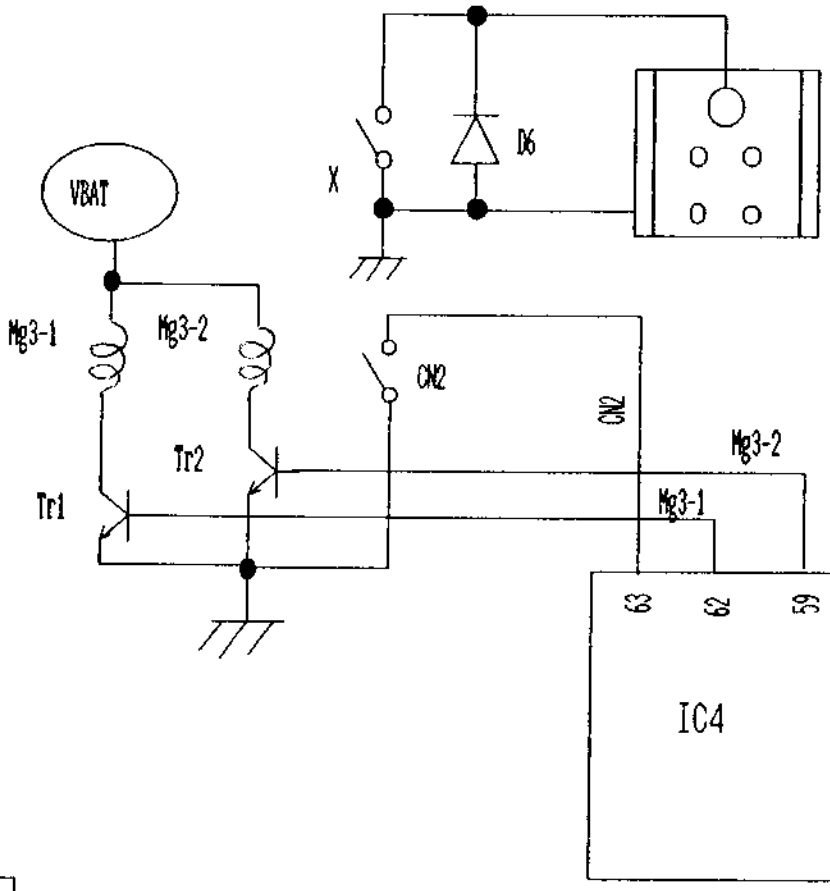
IC4 and IC9 drive motor M2 to execute a mirror up.
SF1 and SF2 are opened and closed according to the phases of mirror and shutter charge.

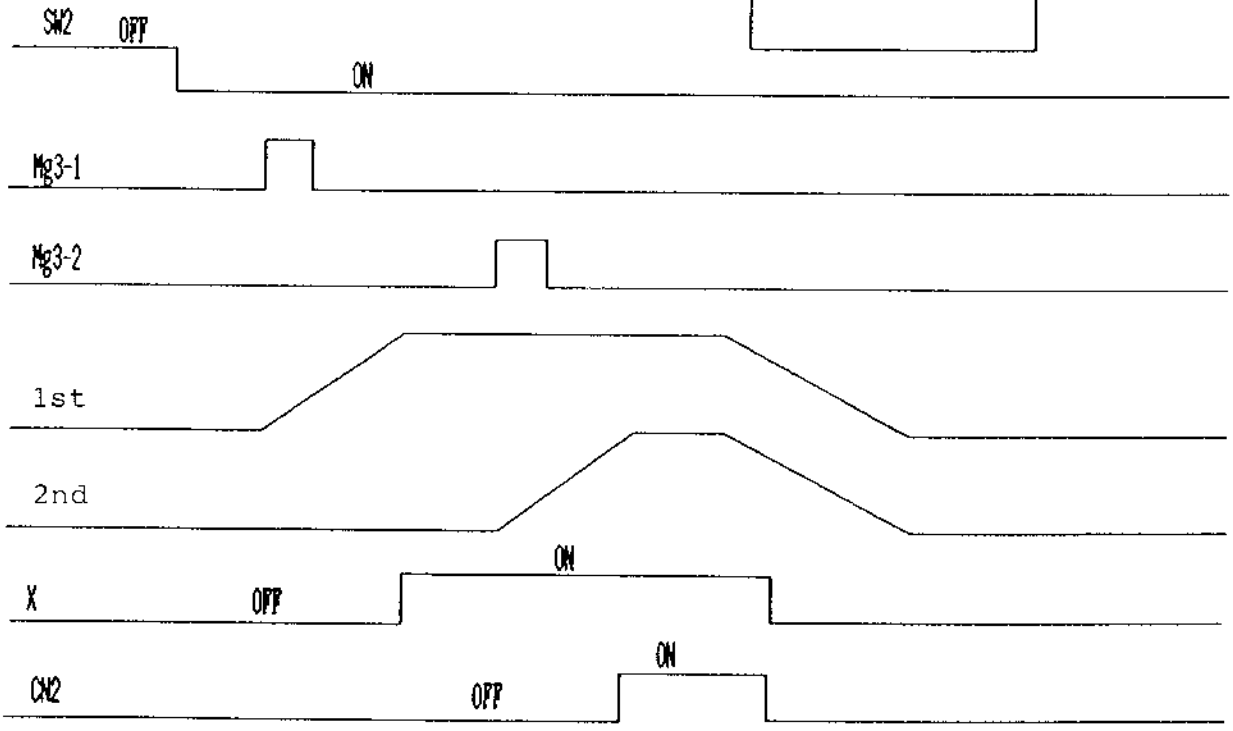


T Control of shutter

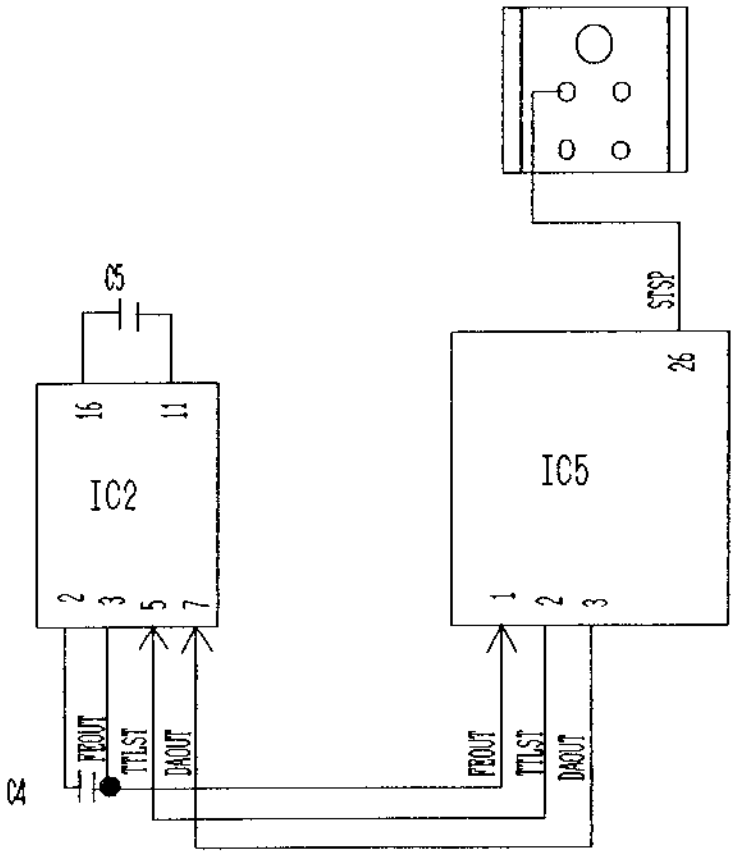
IC4 controls Mg3-1 and Mg3-2 with Tr1 and Tr2 in order to control 1st and 2nd curtains.



U Light adjustment

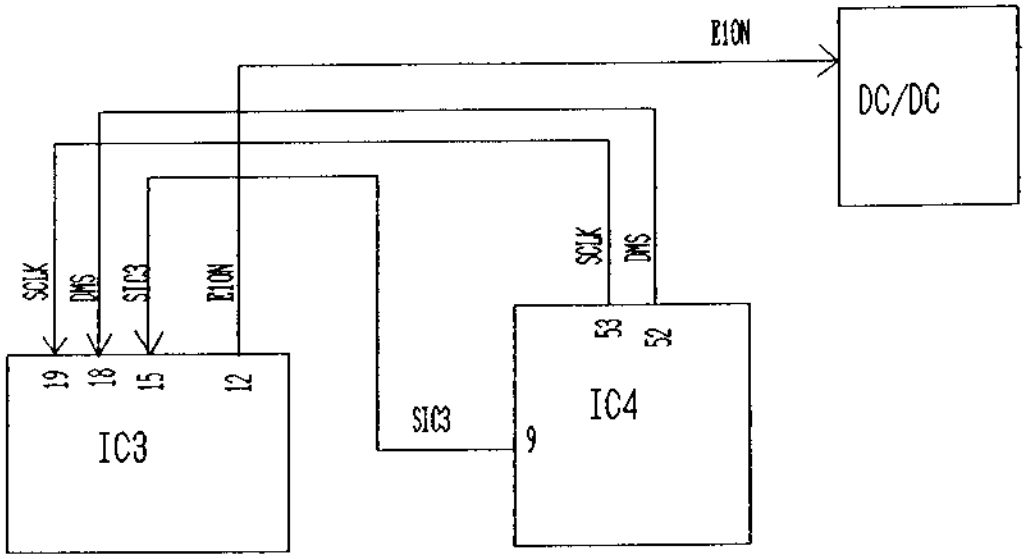
IC5 transfers ISO and the compensation value of light adjustment to IC2 through DAOUT.
And IC5 initiates or terminates light adjustment through TTLST.
IC2 transfers the result of light adjustment through FEOUT.
When the voltage of FEOUT reaches to a reference voltage, IC5 transfers STSP signal in order to terminate the luminescence of speedlite .



Z DC/DC OFF

By the signals of SIC3, SCLK and DMS, IC4 directs IC3 to turn DC/DC off.

IC3 turns E1ON to H in order to terminate DC/DC.

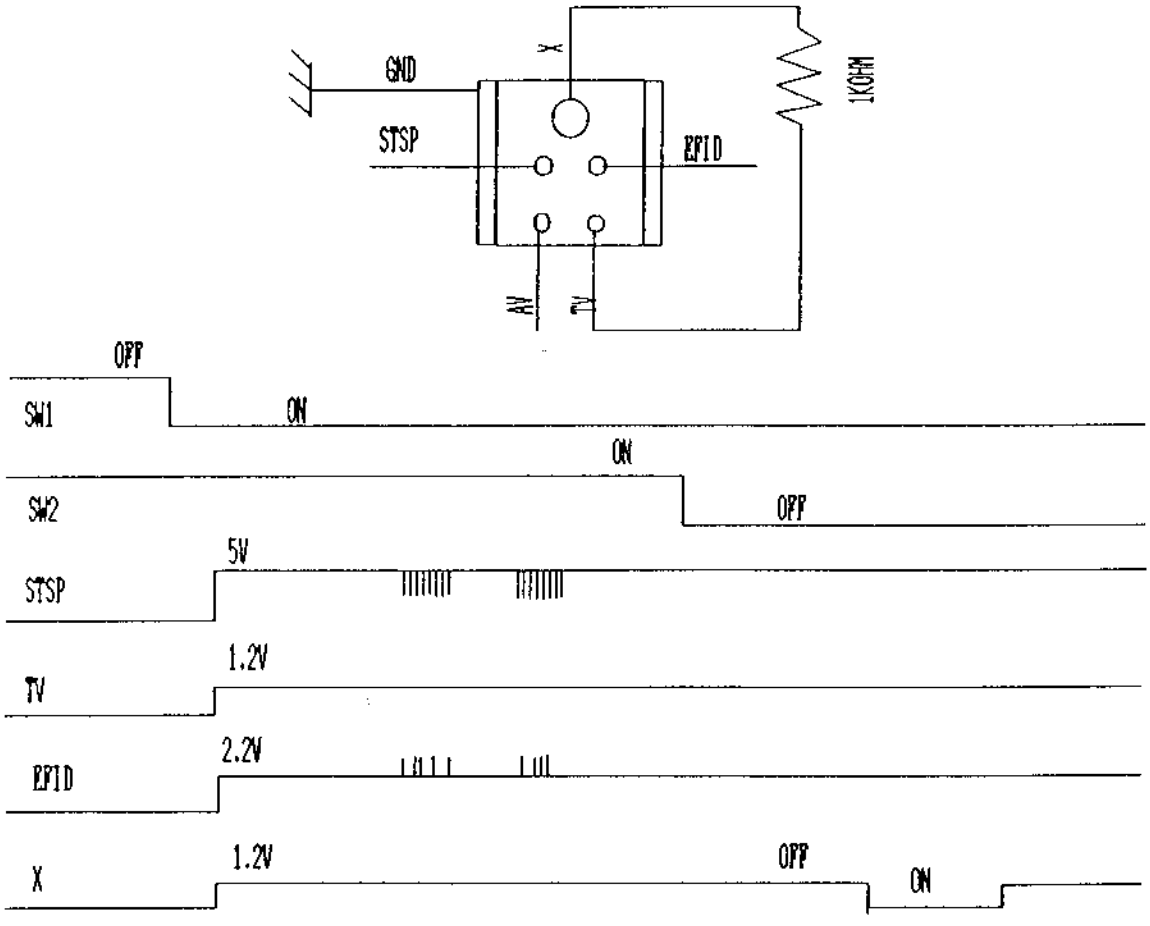


(4) Check point

(4-1) Hotshoe

When you close SW1 and SW2, the waveforms as shown below appear at each terminal.

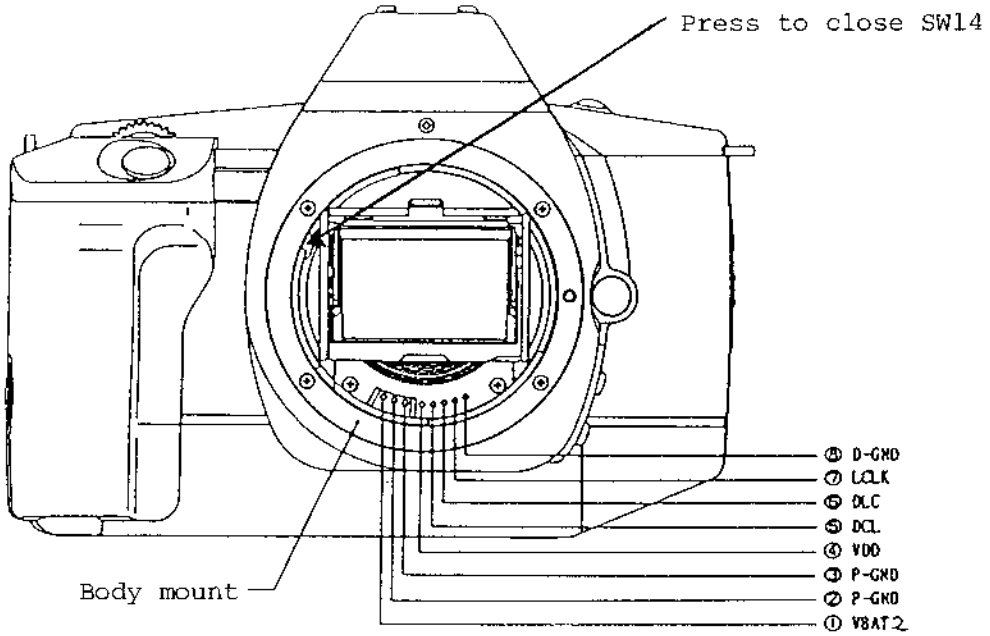
| | | |
|---|---|---|
| X | Impossible to turn on. | -- Check shutter unit and wiring. |
| TV | Impossible to output. | -- Check IC5 and wiring. |
| STSP | Impossible to output. | -- Check IC5 and wiring. |
| EFID | Impossible to output. | -- Check IC5 and wiring. |

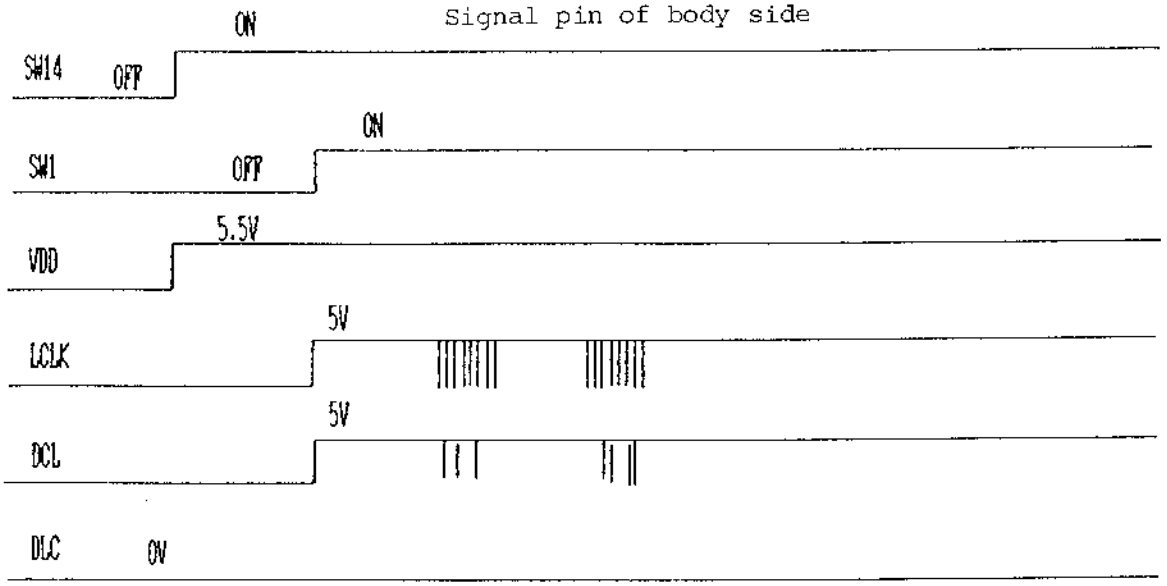


(4-2) Lens mount

When you keep lens switch (SW14) closing and close SW1, the waveforms as shown below appear at each terminal.

| | | |
|---|---|---|
| VDD | Impossible to output | -- Check SW14, DC/DC and wiring. |
| LCLK | Impossible to output | -- Check IC5 and wiring. |
| DCL | Impossible to output | -- Check IC5 and wiring. |
| DLC | Impossible to output | -- Check IC5 and wiring. |
| VBAT2 | Impossible to output | -- Check IC4, IC8, IC10 and wiring. |

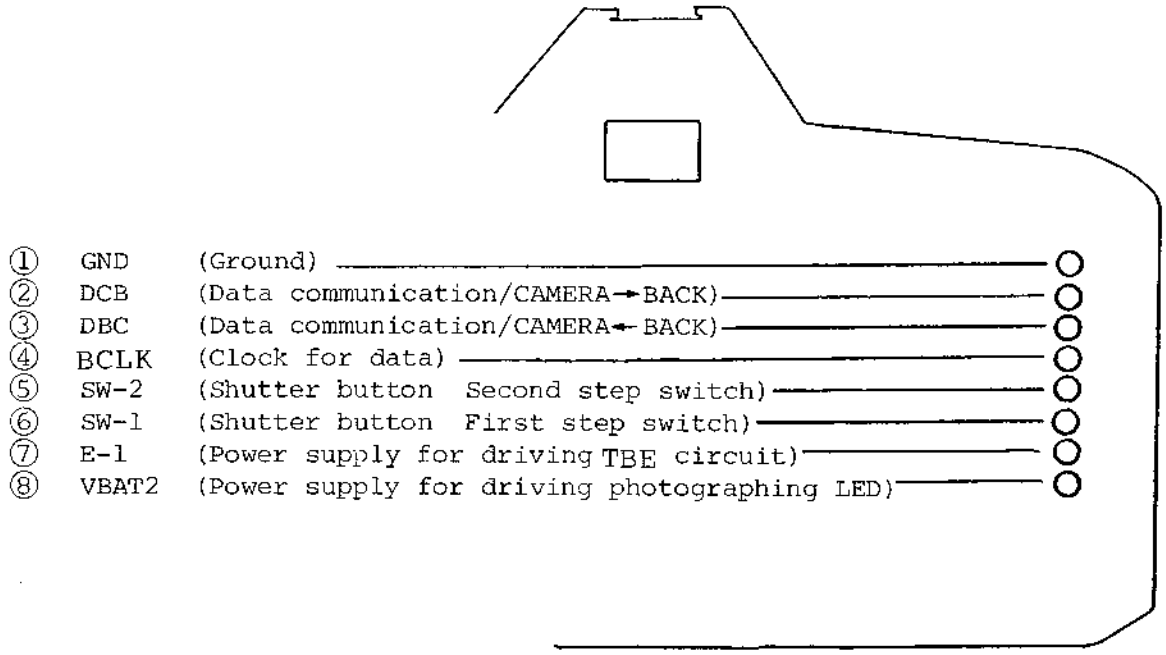


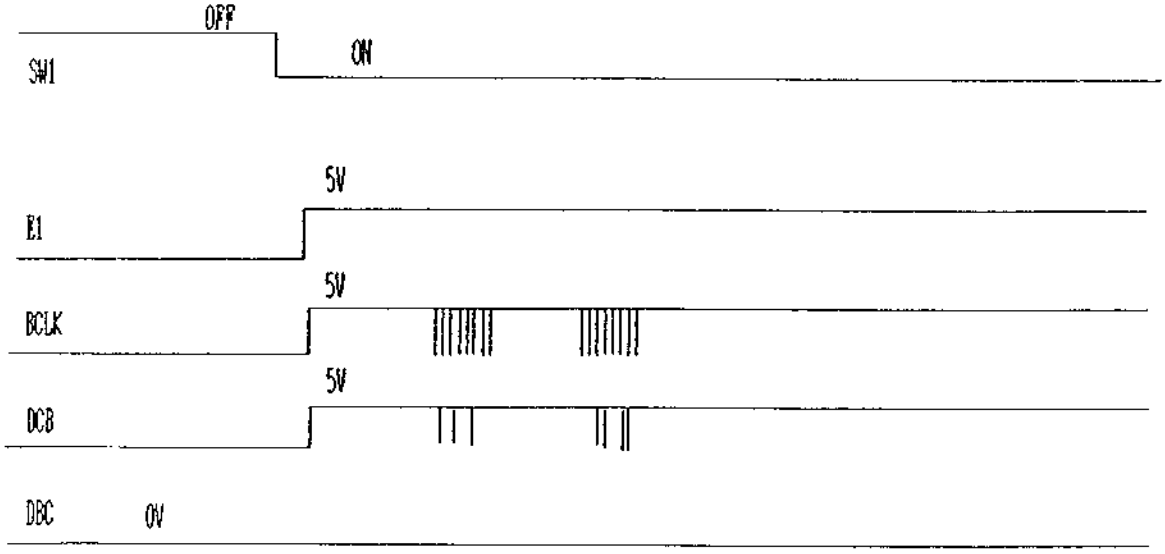



(4-3) Rear cover contact

When you close SW1, the waveforms as shown below appear at each terminal.

| | |
|---|---|
| SW1 | Impossible to output -- Check SW1 and wiring. |
| BCLK | Impossible to output -- Check IC5 and wiring. |
| DLC | Impossible to output -- Check IC5 and wiring. |
| DCL | Impossible to output -- Check IC5 and wiring. |
| E1 | Impossible to output -- Check DC/DC, IC3 and wiring. |

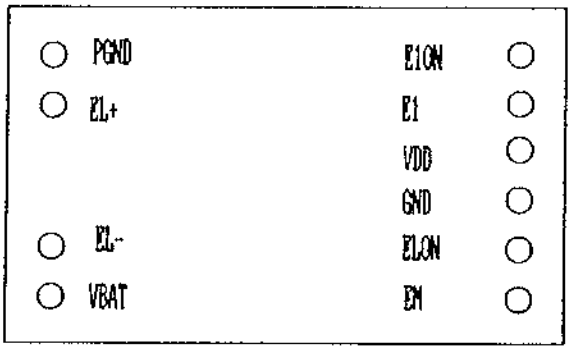

① GND (Ground)
② DCB (Data communication/CAMERA→BACK)
③ DBC (Data communication/CAMERA←BACK)
④ BCLK (Clock for data)
⑤ SW-2 (Shutter button Second step switch)
⑥ SW-1 (Shutter button First step switch)
⑦ E-1 (Power supply for driving TBE circuit)
⑧ VBAT2 (Power supply for driving photographing LED)

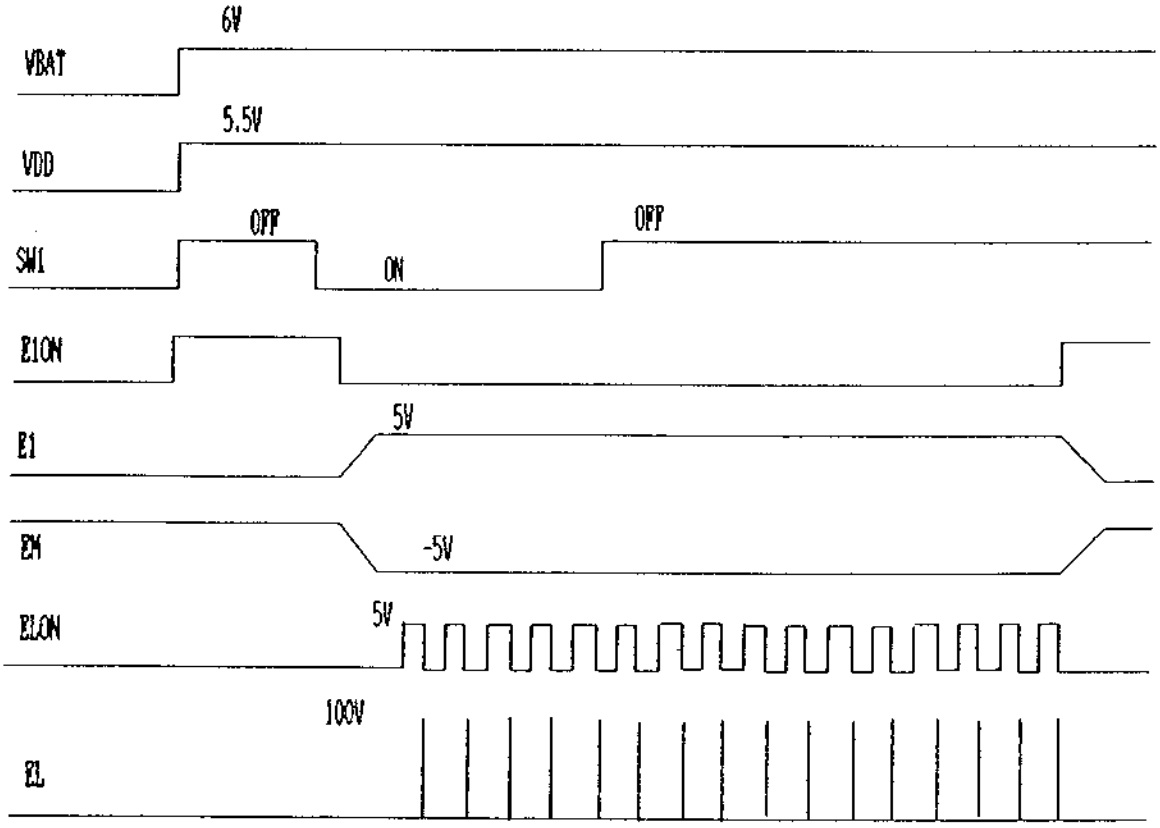


(4-4) DC/DC

When you set battery and grip and close SW1, the waveforms as shown below appear at each terminal.

| | | |
|---|---|---|
| VBAT | Impossible to input | -- Check battery and wiring. |
| VDD | Impossible to output | -- Check DC/DC and wiring. |
| E1ON | Impossible to input | -- Check IC3 and wiring. |
| E1 | Impossible to output | -- Check DC/DC and wiring. |
| EM | Impossible to output | -- Check DC/DC and wiring. |
| ELON | Impossible to input | -- Check IC4 and wiring. |
| EL | Impossible to output | -- Check DC/DC and wiring. |

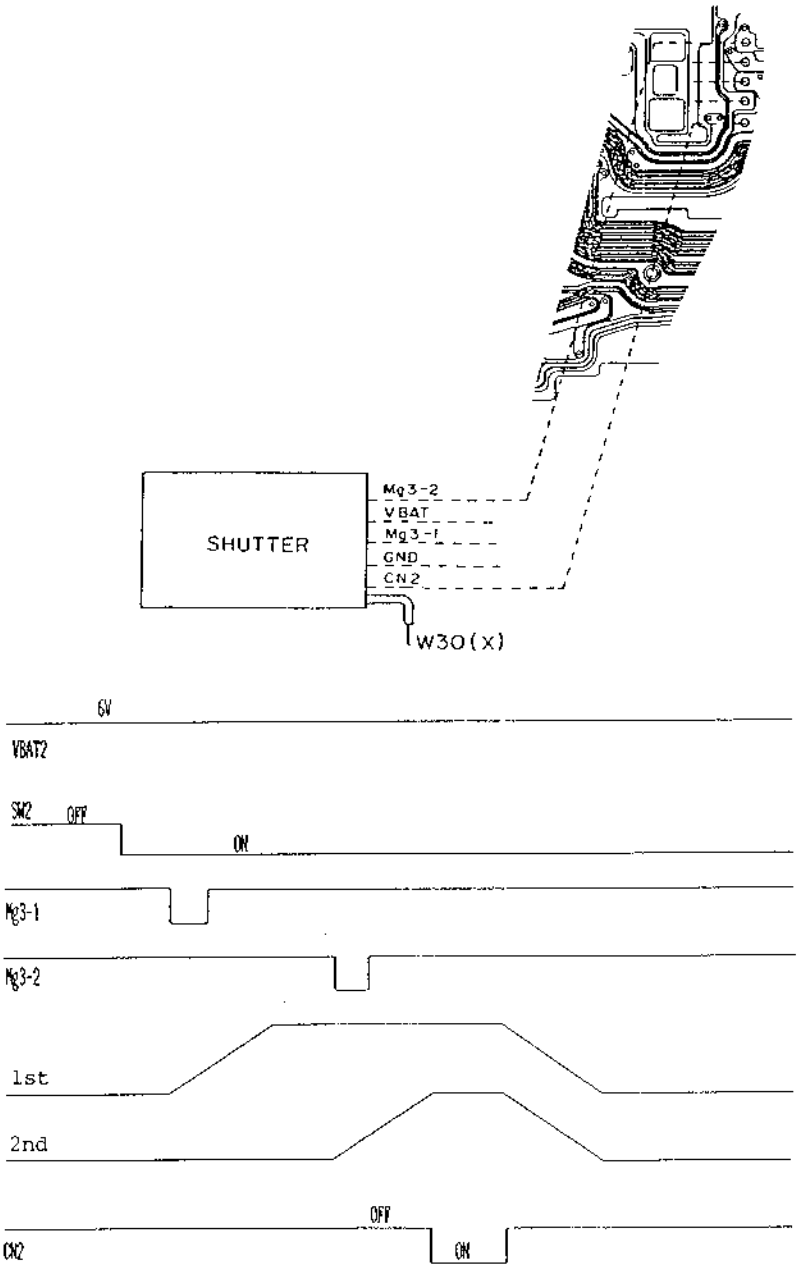


(4-5) Shutter operation

When you close SW2, the waveforms as shown below appear at each terminal.

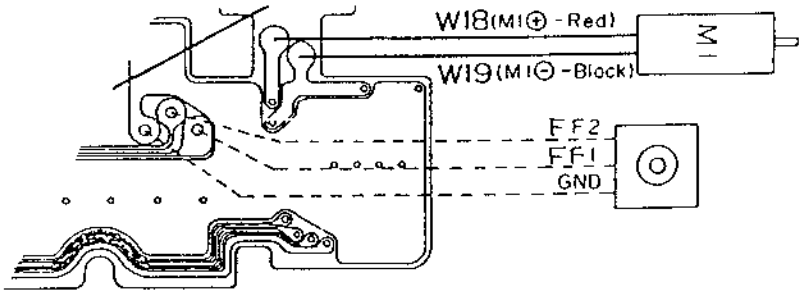
| | | |
|---|---|---|
| VBAT | Impossible to output | -- Check W22 and battery. |
| Mg3-1 | Impossible to output | -- Check IC4. |
| Mg3-2 | Impossible to output | -- Check IC4. |
| CN2 | Impossible to turn on | -- Check shutter unit. |

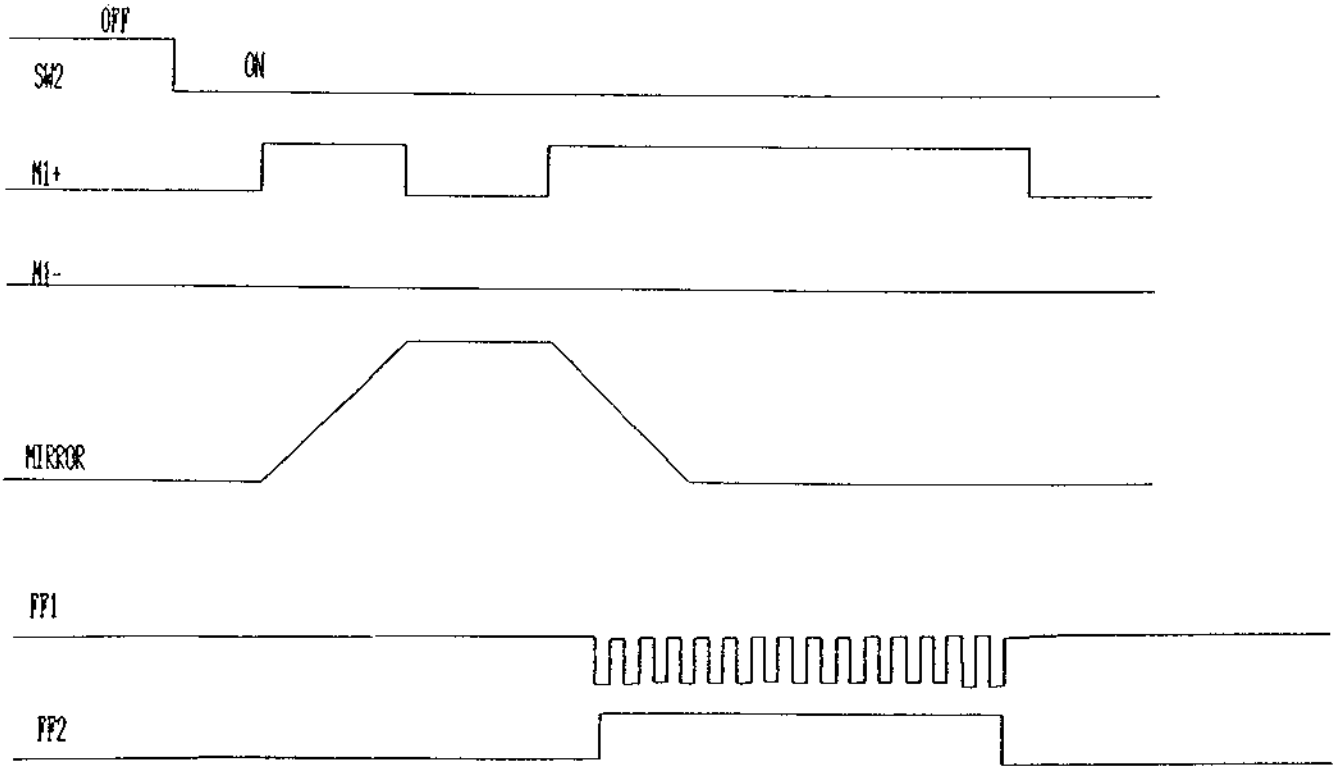


(4-6) Motor M1, Film phase

When you turn SW2 on, the waveforms as shown below appear at each terminal.

M1 + Impossible to output -- Check M1 and wiring.
M1 - Impossible to output -- Check M1 and wiring.
FF1 Impossible to output -- Check FF1 and wiring.
FF2 Impossible to output -- Check FF2 and wiring.



(4-7) Upper part of camera

Unless each switch can be turned on or off, check each switch and wiring.

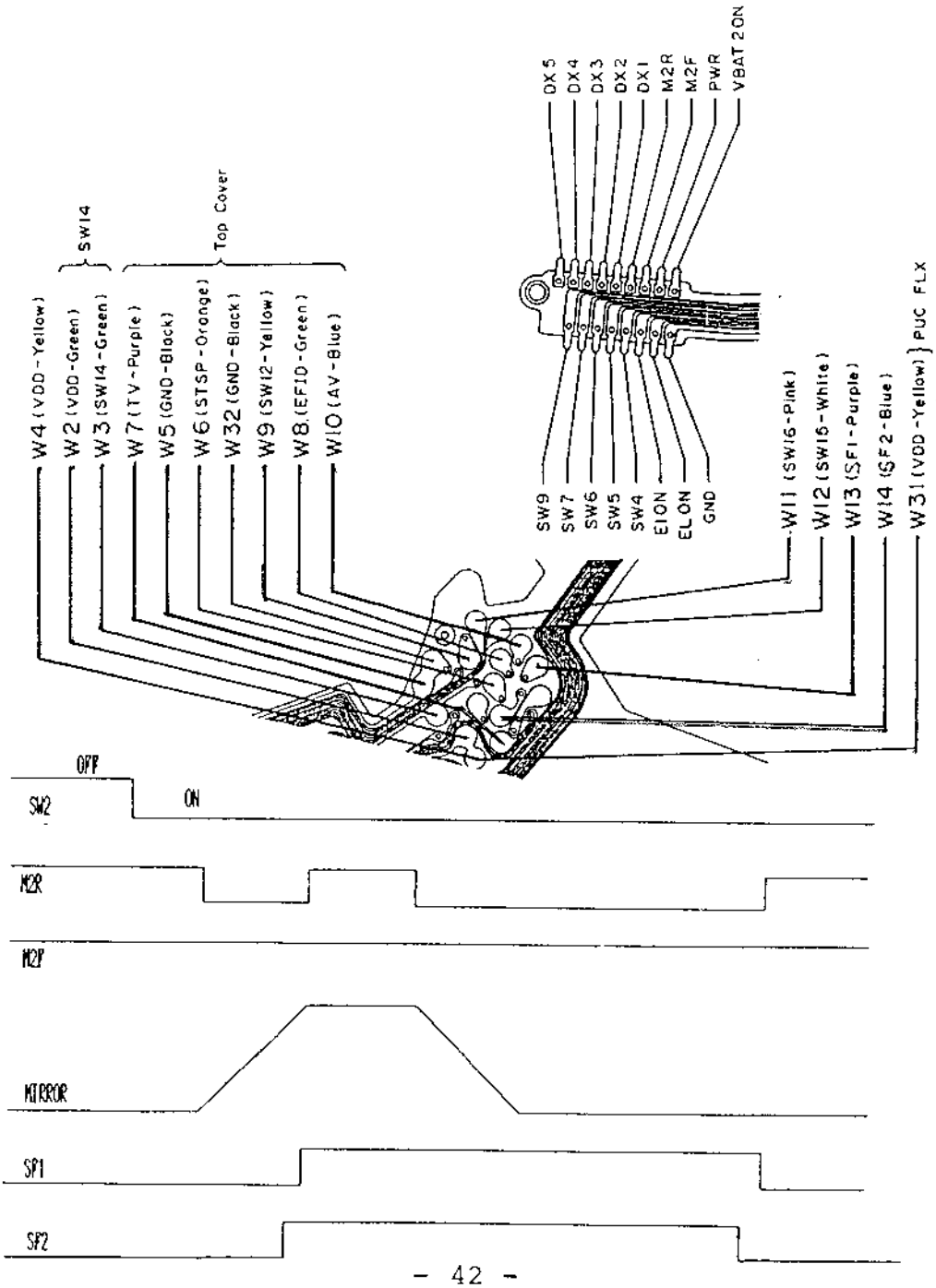
In the state of mirror up, the waveforms of M2R, M2F , SF1 and SF2 terminals appear such as below.

M2R Impossible to input -- Check IC4 and wiring.

M2F Impossible to input -- Check IC4 and wiring.

SF1 Impossible to input -- Check SF1 and wiring.

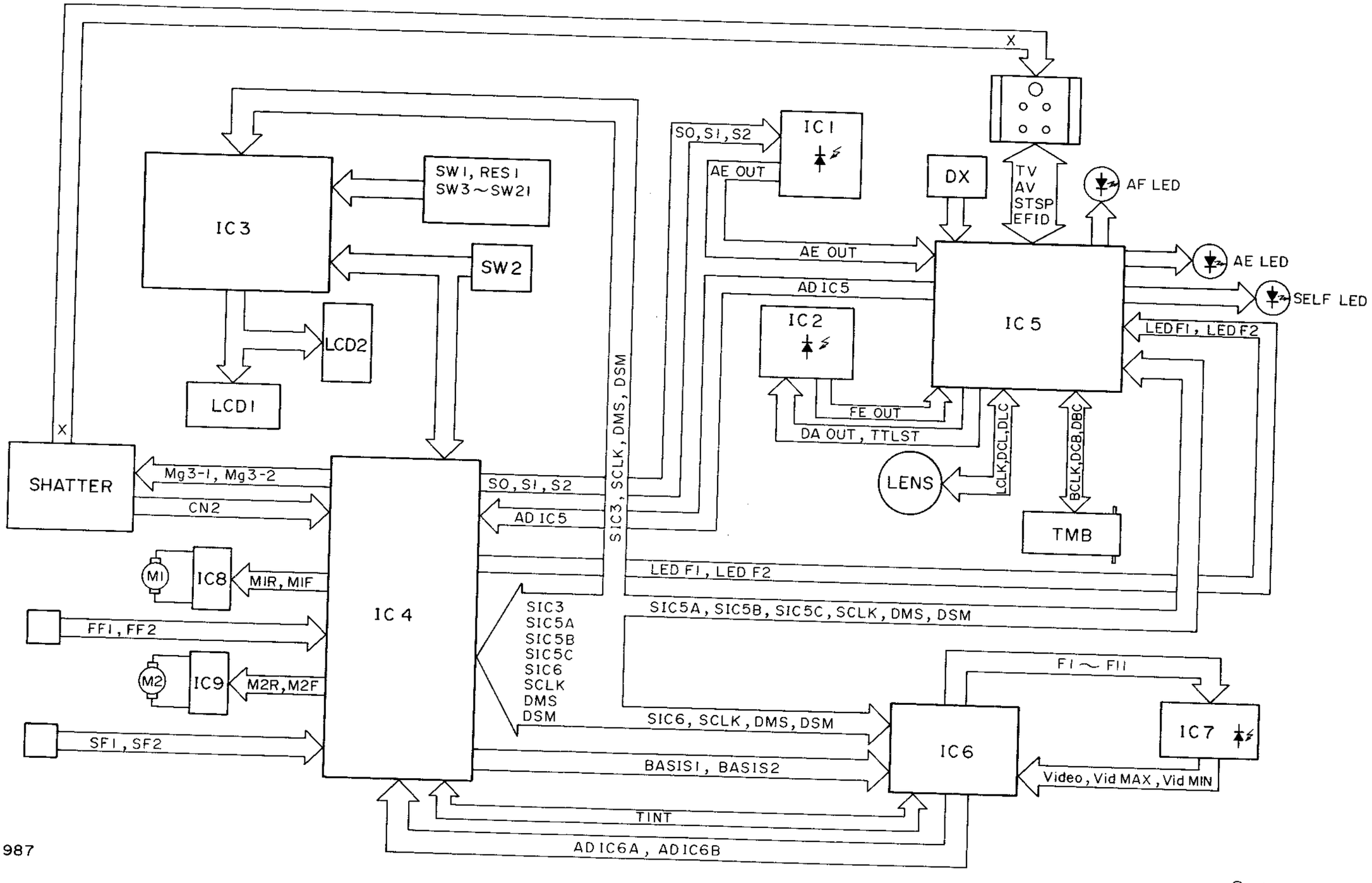
SF2 Impossible to input -- Check SF2 and wiring.



BLOCK DIAGRAM

# CANON EOS 650
# EOS 620

REF. NO. C12-8032
C12-8022



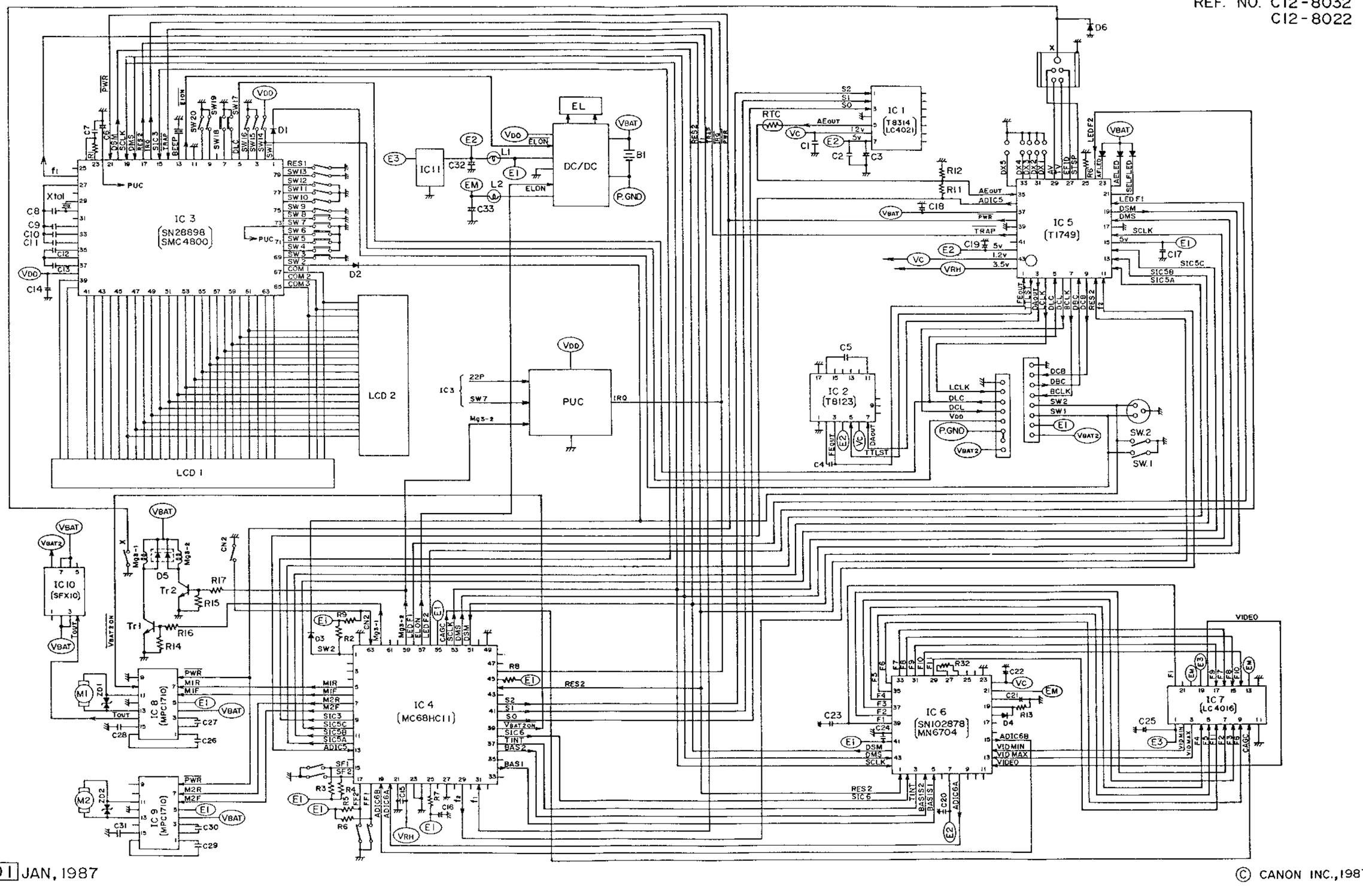

01 JAN, 1987

© CANON INC, 1987

# CANON EOS 650
# EOS 620

SCHEMATIC DIAGRAM
CY8-1621-101-200

REF. NO. C12-8032
C12-8022

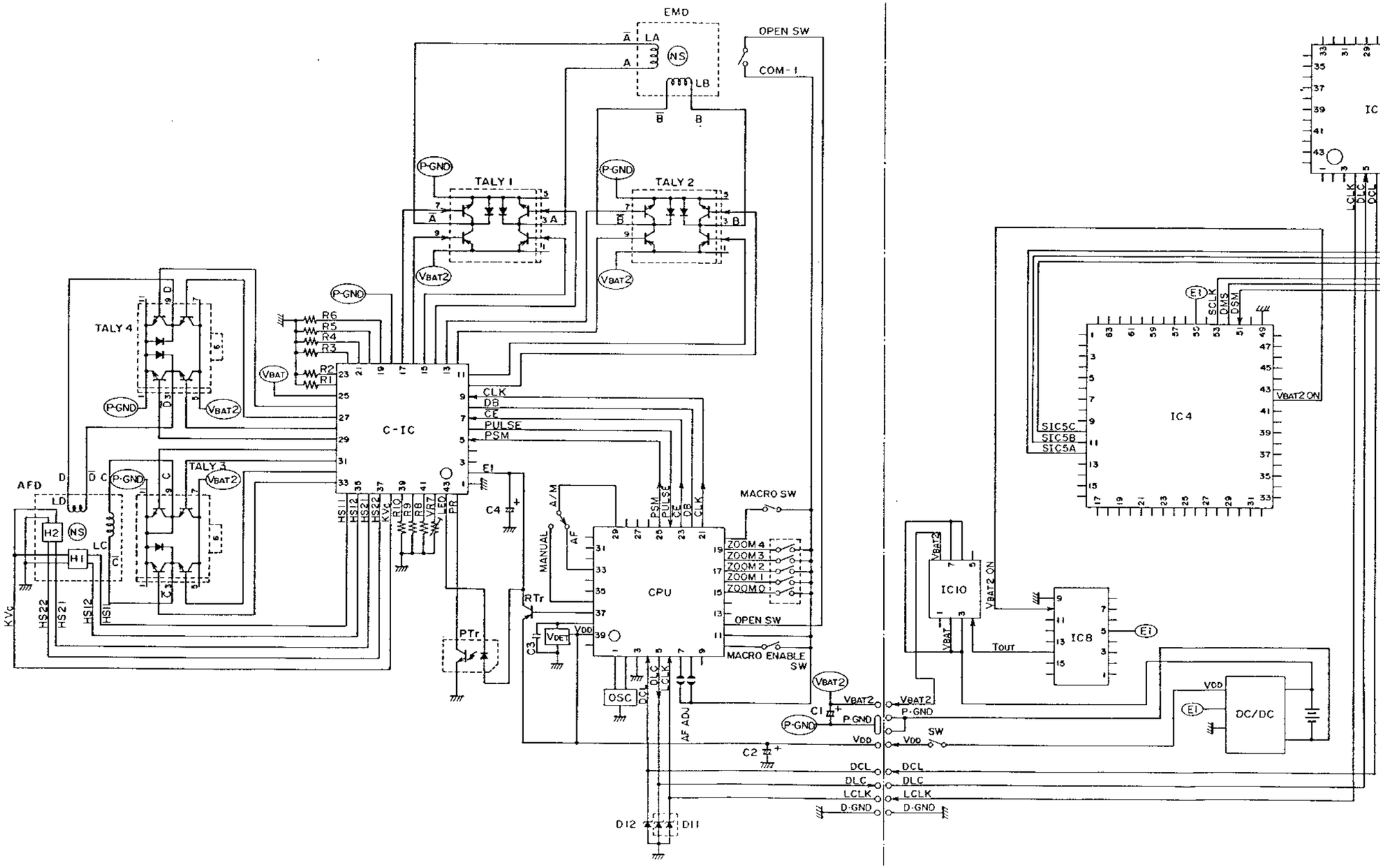



01 JAN, 1987

© CANON INC., 1987

SCHEMATIC DIAGRAM
CY8-1623-101-200

# CANON EF LENS



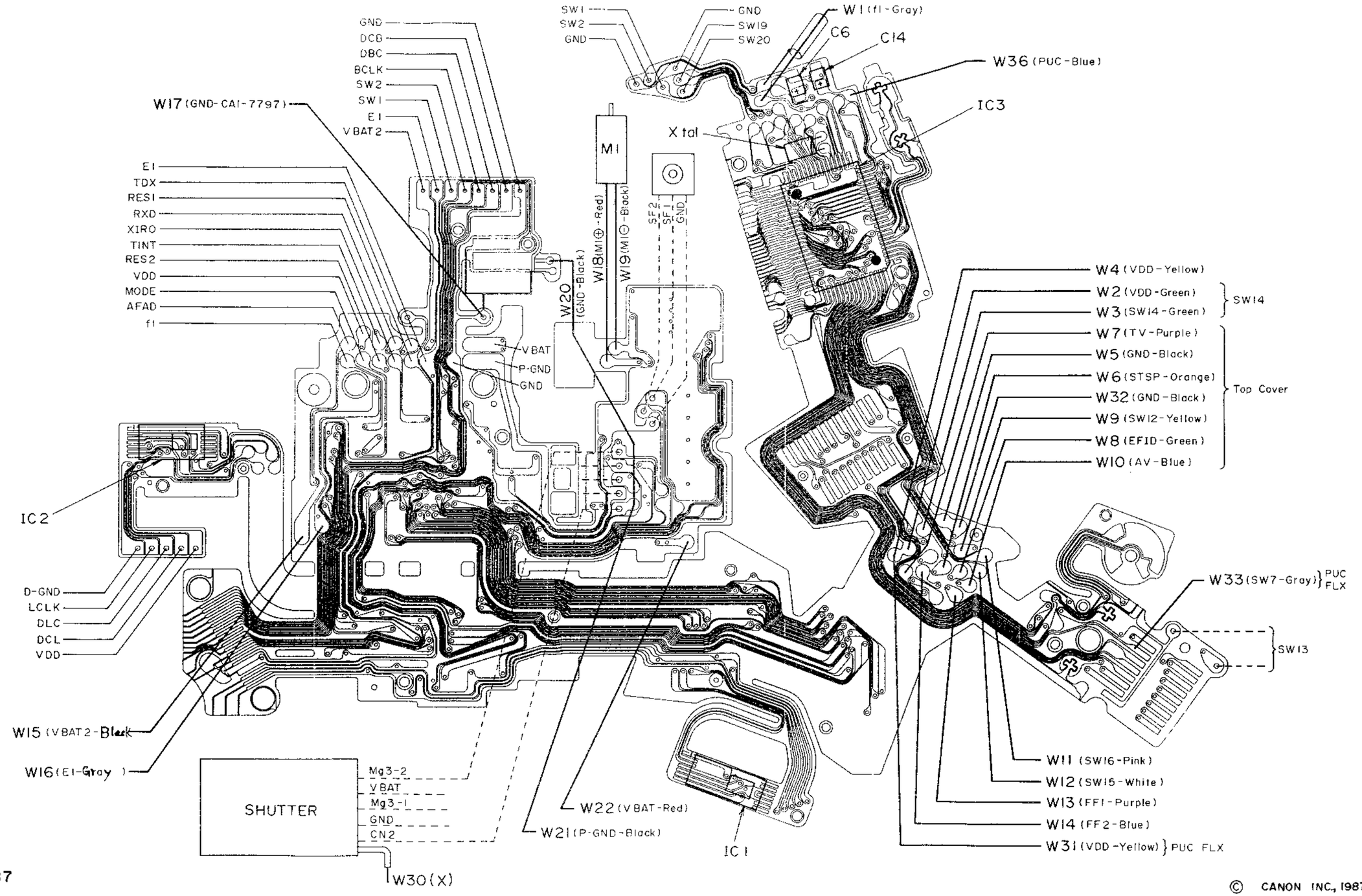

01 JAN, 1987

© CANON INC., 1987

# CANON EOS 650
# EOS 620

REF. NO. C12-8032
C12-8022

## PCB DIAGRAM (MAIN FLX A)
CY8-1421-103-201



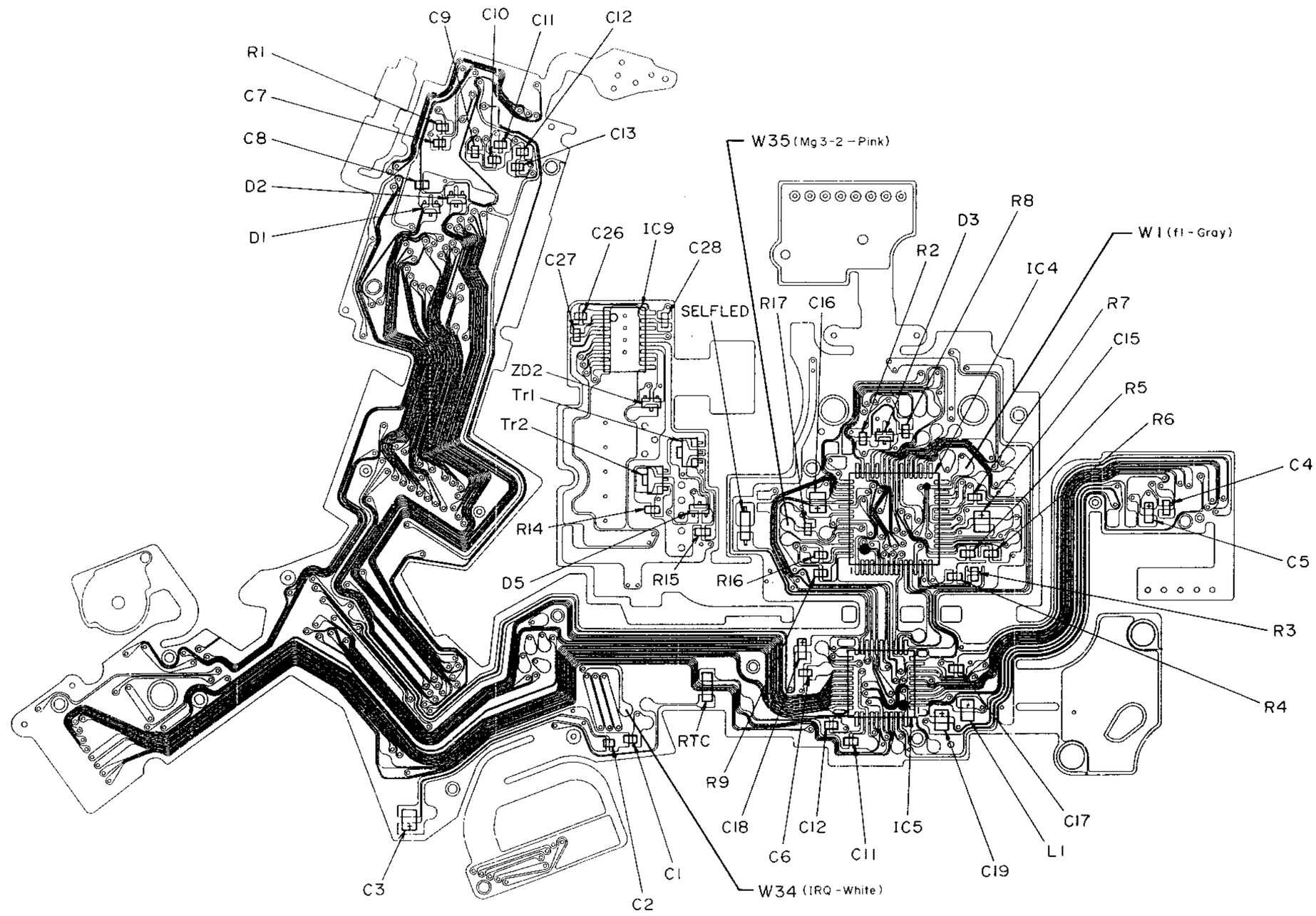

01 JAN, 1987

© CANON INC., 1987

PCB DIAGRAM (MAIN FLX B)
CY8-1421-103-202

# CANON EOS 650
# EOS 620

REF. NO. C12-8032
C12-8022

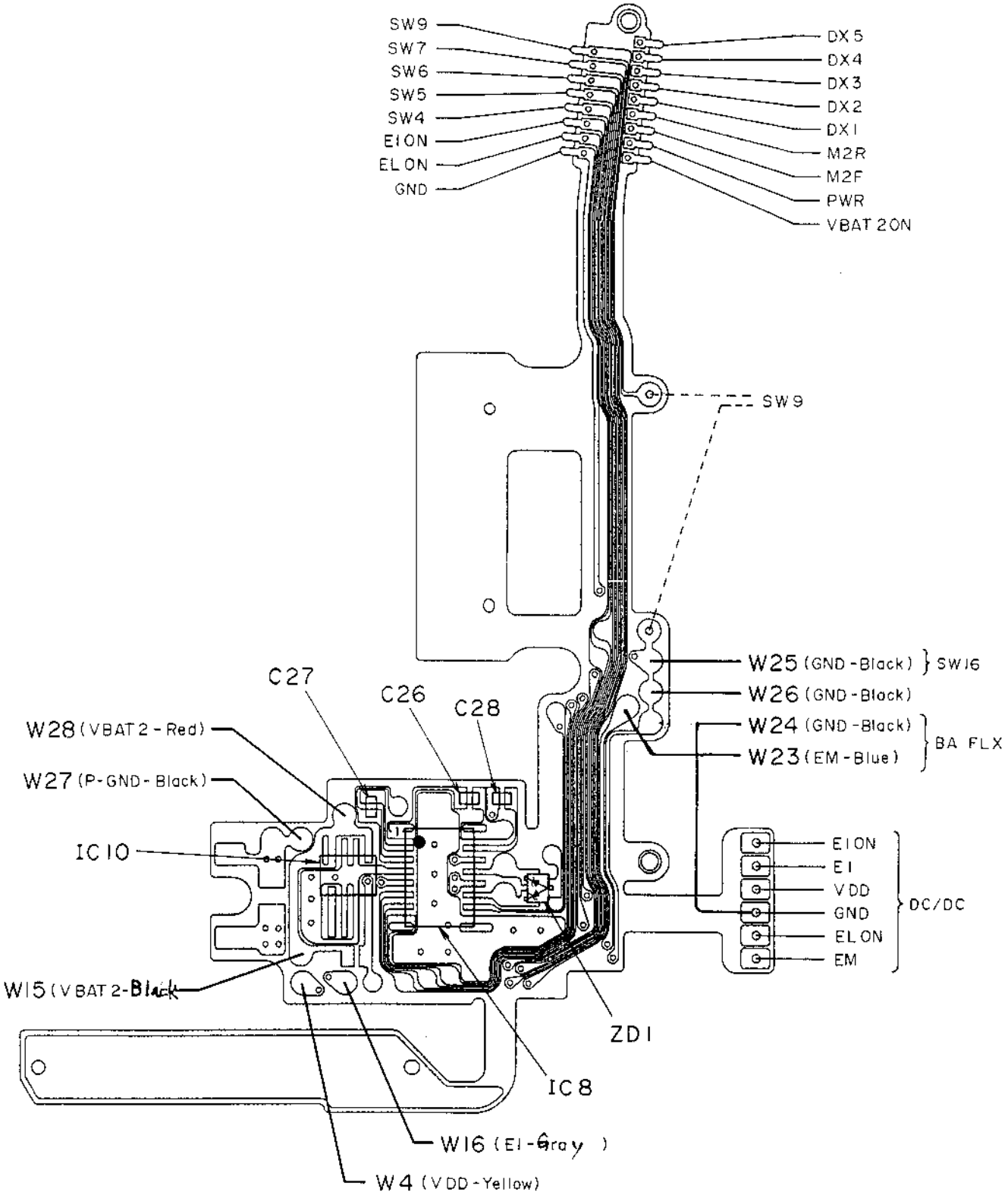



01 JAN, 1987

© CANON INC., 1987

# CANON EOS 650
# EOS 620

## PCB DIAGRAM
CY8-1421-103-203
(D FLX)



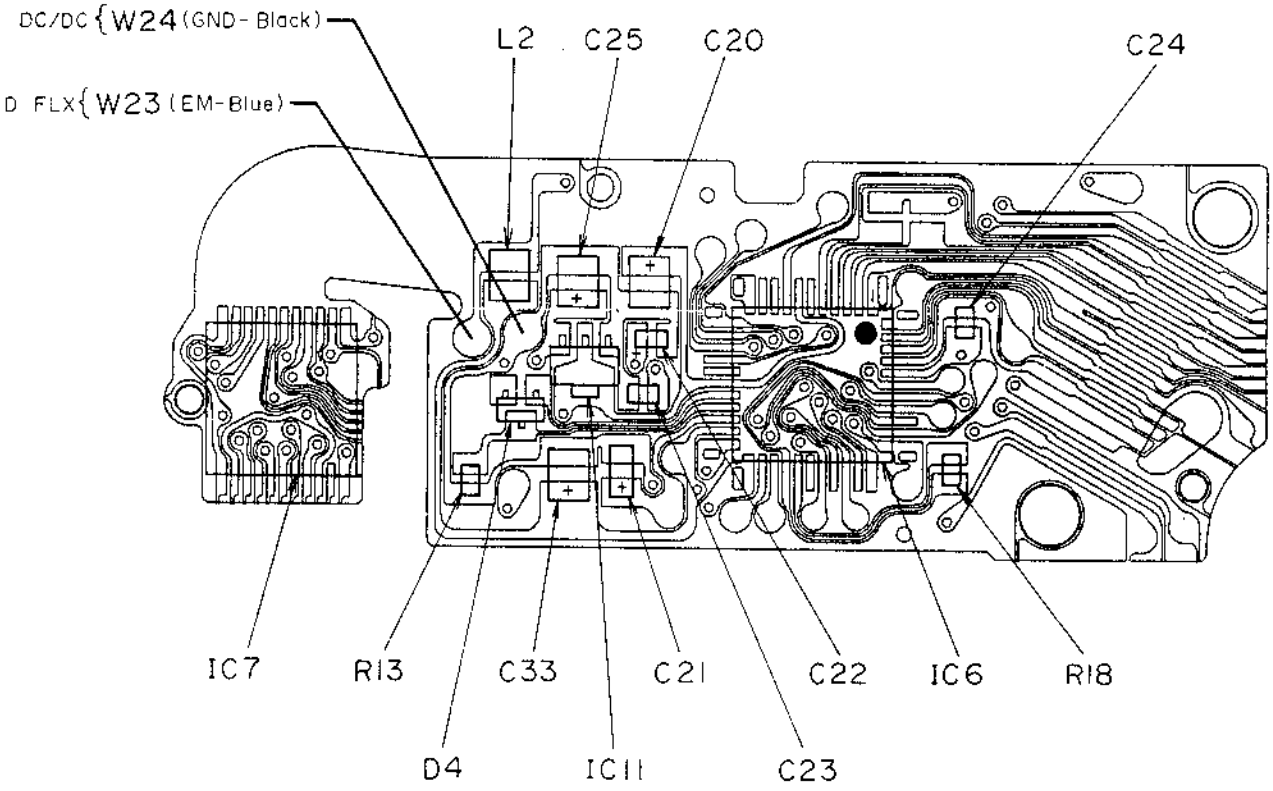



© CANON INC., 1987

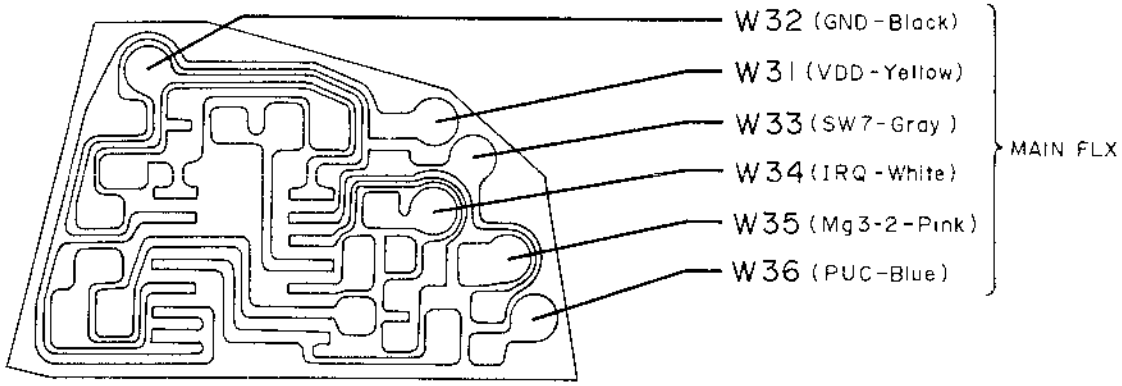
# CANON EOS 650
# EOS 620

## PCB DIAGRAM
CY8-1421-103-204

(BA FLX)




(PUC FLX)



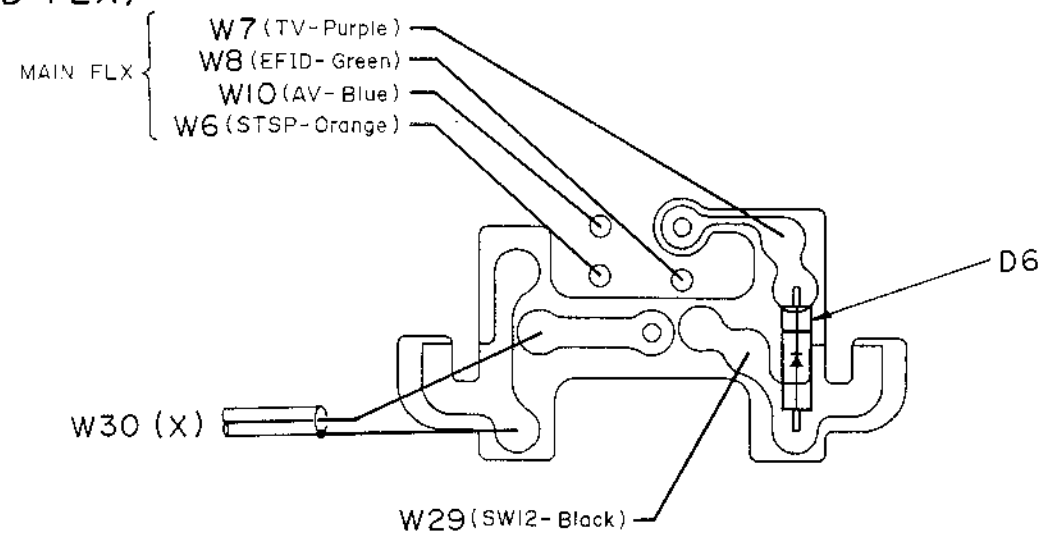


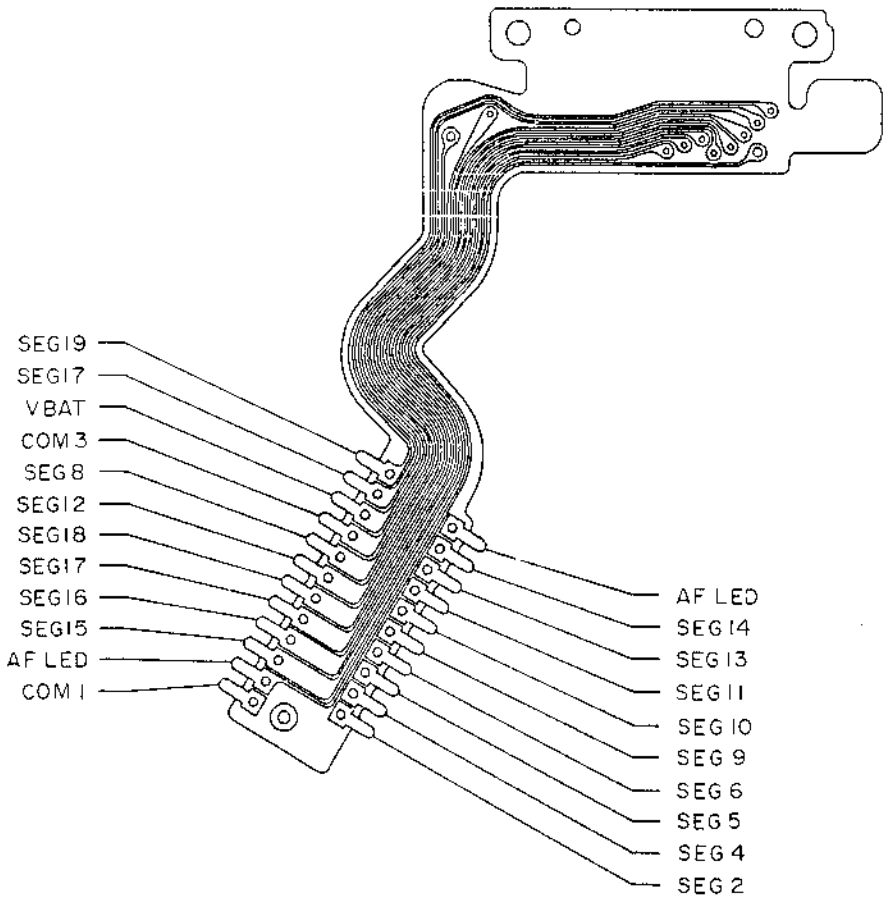

© CANON INC., 1987

# CANON EOS 650
# EOS 620

## PCB DIAGRAM
CY8-1421-103-205

(LCD FLX)






© CANON INC., 1987

# VI. Notes Concerning Use

## [1] Body (EOS 650/EOS620) and Lens

■: This mark indicates items that are covered in the users instructions.

In the "Reasons and Remarks" column, the [+] mark indicates remedial measures.

■ 1. Do not touch the electronic contacts in the mount.
■ 2. Do not touch the electronic contacts on the lens.
[Reasons and remarks]
Bad contact and faulty camera operation may result if contacts become dirty.

■ 3. Do not touch the lens front ring (the moving part) during AF operation.
[Reasons and remarks]
Particular care must be taken with the EF 35-70mm f/3.5-4.5, EF 35-105mm f/3.5-4.5 and EF 28-70mm f/3.5-4.5 because their structure makes the front ring particularly sensitive to touch. The lens will stop if the force resisting movement is greater than the power of the AF drive mechanism. However, this will not damage the lens.
[+]: The front ring can be made less accessible to accidental contact by using a lens hood.

■ 4. With the EF 35-70mm f/3.5-4.5 and EF 28-70mm f/3.5-4.5 lenses, zoom the lens to the wide-angle end and immobilize the zooming ring before attaching/removing filters or adjusting polarizing filters.
[Reasons and remarks]
Same as the FD 35-70mm f/3.5-4.5 and FD 28-55mm f/3.5-4.5 lenses.

■ 5. The Extender EF 2X is for exclusive use with the EF 300mm f/2.8L lens and must not be used with other lenses.
[Reasons and remarks]
This accessory will fit on the following lenses besides the EF 300mm f/2.8L. While focusing is done manually, the accessory can be used with the following lenses. However, AF ranging will not function properly.
1) EF Softfocus 135mm f/2.8
2) EF 100-300mm f/5.6
3) EF 100-300mm f/5.6L
4) EF 50-200mm f/3.5-4.5
5) EF 50-200mm f/3.5-4.5L

■ 6. Notes concerning use of the DEPTH (depth-of-field AE) mode
1) The picture should be composed before using the DEPTH mode. Do not change the lens focal length between DEP-1, DEP-2 and DEP-3 operations.
[Reasons and remarks]
No problems arise if the lens is zoomed from TELE to WIDE, but the reverse is not true, and results are not assured.
2) Take advantage of the basis characteristics of the lens when using DEPTH mode.
[Reasons and remarks]
Shorter focal lengths are more appropiate for obtaining greater depth of field.
3) Use a focal length under 200mm when you want to use the DEPTH mode to obtain relatively greater depth of field.
[Reasons and remarks]
Same as for 2) above.
4) When using the EF Softfocus 135mm f/2.8, it is recommended that the DEPTH mode not be used with SOFT setting.
[Reasons and remarks]
The soft effect will not be obtained when the aperture is stopped down.
*DEPTH photography is possible if DEP-1, DEP-2 and DEP-3 are all done at the same soft setting, but if the soft setting is changed between these steps, the range will be miscalculated and the picture improperly focused.

■ 7. When the lens switch is set to the full auto position (green mark), all body operations except battery check and mid-roll rewind are disabled.
[Reasons and remarks]
This is because this position indicates the fully automatic position for AF snapshot photography.

■ 8. Self-timer photography is not possible when the main switch is set to the full auto position.
[Reasons and remarks]
This limitation prevents setting the self-timer mode.

9. The focus mode switch can be changed even when the main switch is set to the full auto position.
[Reasons and remarks]
With previous cameras, AE photography required setting the lens to the "A" mark, a major premise for fully automatic photography at the green mark setting is that lens focus mode switch be set to the AF mode.

10. When focusing the EF Softfocus 135mm f/2.8 lens manually, the picture must be focused after first setting the lens to SOFT.
[Reasons and remarks]
The picture will not be in focus if it is manually focused at the normal setting, then the lens is switched to SOFT.
[+]: In general, it is recommended that the AF mode be used with soft-focus photography.

11. When AF auxiliary light is used in the servo AF mode, AF remains locked once focusing has been completed. AF will not operate again until SW-1 goes OFF once and then ON again.
[Reasons and remarks]
Inherent in the design specifications.
[+]: Release SW-1 and then press it again to re-range.

12. In the one-shot AF mode, use the following procedure to read out the focus preset value stored in the EF 300mm f/2.8L lens.
1) Aim at the ranging point (the value stored) in the viewfinder.
2) Press the FP (focus preset) readout button on the lens.
3) Press SW-1/SW-2 on the body to take the picture.
[Reasons and remarks]
AE locks for exposure when SW-1 and the FP button are both ON. Therefore, if the FP button is pressed while SW-1 is ON and the camera is aimed at a point other than the focusing point (scene A), then the picture is taken after re-aiming the camera at the focusing point, the picture will be taken with the exposure for scene A rather than for the focusing point. This means that the procedure described above must be followed to obtain proper exposure.

13. Pictures will be out of focus if AF photography is used together with black-and-white infrared film.
[Reasons and remarks]
AF operation is adjusted to provide proper focusing with ordinary film at visible light wavelength.
[+]: After AF focusing, switch to the manual focusing mode and adjust the focus by using the infrared index mark.
*With color infrared film, the film characteristics are such that AF photography can be used without adjustment. (the film is sensitive to visible light as well as to infrared.)

14. Battery replacement is difficult while the body is mounted on a tripod.
[Reasons and remarks]
Same reason as the T90.
[+]: Remove the camera from the tripod.

15. Make sure that the grip is securely installed.
[Reasons and remarks]
The grip mounting screw soon comes loose if it is only finger-tightened, use a coin to tighten the screw.

16. Set the main switch "L" when carrying the camera.
[Reasons and remarks]
To prevent accidental camera operation.
*If the camera is left ON, battery current will flow if the depth-of-field check button is accidentally pressed. (as can happen if the camera is placed in a bag, etc.)

17. Always set lenses with the front end down after removing them from the camera.
[Reasons and remarks]
To protect the electronic contacts from scratches, and to protect the front lens glass.
*Particular care is required when handling the EF 50mm f/1.0L lens because its rear glass extends beyond the end of the mount.

18. If the lens hood is reversed on the EF 50mm f/1.8 or EF 28mm f/2.8 lens while it is installed on the camera, the lens cannot be removed without first removing the hood.
[+]: First remove the hood, then remove the lens.

19. In some cases the camera-shake warning (long electronic beeper) may sound for a particular shutter speed, while in other cases it may not sound even though the shutter speed is the same.
[Reasons and remarks]
This is because the control step for operation of the camera-shake warning may vary from the actual control step by as much as 0.5 step.

20. All signal input except for the main switch going OFF and the BC button are ignored after SW-2 goes ON.
[Reasons and remarks]
Inherent in the design specifications. (For example, if the self-timer is operating: (1)the flash will not operate even though charging is completed prior to exposure; (2)camera operation is not affected by manipulating the electronic input dial; (3)auto loading will not operate upon inserting film.)

21. When SW-1 goes ON after flash charging has been completed, the aperture and X-sync shutter speed are set automatically with peripheral metering. If partial metering button is then pressed in this state, metering is done over in the partial metering mode, Tv and Av values are reset, and flash photography is based on the new Av value.
    [Reasons and remarks]
    Inherent in the design specifications.
    *The only difference is that operation is based on partial metering rather than peripheral metering. Proper exposure of both the background and the main subject can be obtained by aiming at tha background with partial metering, then composing the picture with the main subject in the center of the viewfinder.

22. The lens has no aperture scale or minimum aperture marking.
    [+]: Aperture can be checked by looking at the body's LCD panel with the camera in the aperture-priority AE mode.

23. Zoom lenses have no depth-of-field scale.
    [+]: Check the subject depth of field by looking into the viewfinder and pusing in the depth-of-field check button.

24. If SW-2 goes ON while the extender or extension tube is installed and the master lens is not installed, the mirror is raised, the BC indicator flashes, then operation stops.
    [Reasons and remarks]
    Inherent in the design specifications.
    [+]: The camera is immediately restored to its original condition when SW-1 goes ON again.

25. Neither the EOS 650 nor the EOS 620 can take more than 36 exposures per roll.
    [Reasons and remarks]
    Inherent in the design specifications. As the T90, auto rewind begins when the frame counter passes the 36th exposure.

26. Be careful not to touch the shutter blades.
    [Reasons and remarks]
    Shutter blade strength
    EOS 650: Same as the T70 and T80.
    EOS 620: Same as the T90.

[2] Flash system

■ 1. Guideline for battery replacement
Batteries should be replaced as soon as possible if it takes more than 10 seconds for the yellow-green pilot lamp to light.
[Reasons and remarks]
In the condition indicated above, charging will not be sufficient to light the red pilot lamp. This indicates that the batteries are very worn.
* With the 300EZ, the camera lock up (operation will be disabled) if the batteries are worn to the point where even the yellow-green pilot lamp does not light. That is, when voltage per batteries drops to 0.3-0.5V, or nearly dead.
[+]: Normal camera operation can be restored by turning off the flash's main switch or removing the flash from the camera. Lock-up does not take place when using the 420EZ.

2. When the flash's SE function operates, power is restored by pressing any camera switch.
[Reasons and remarks]
Inherent in the design specifications.
* Power is also restored by setting the main switch from ON to OFF or pressing the pilot lamp.

3. If the flash is mounted on the camera but no lens is attached, the zoom position is initially set to 35mm when the flash power is turned on; however, when SW-1 on the body goes ON, the zoom position is automatically set to 50mm.
[Reasons and remarks]
Inherent in the design specifications.

■ 4. Manual display does not appear on the camera when the flash is used in the manual mode.
[Reasons and remarks]
This is because the camera cannot distinguish this situation from when the camera is in the manual exposure mode. However, if the flash is set to manual while camera is in the AE mode, the minimum aperture value display will flash on and off (except with the aperture-priority AE) to show that manual setting is required.

[3] Data Back System

■ 1. With the Quartz Date Back E, the speed of continuous exposures will be slower when using data imprint. (Speed also varies according to ISO film speed.)

| | |
|---|---|
| ISO 25 | --- Approx. 0.8 fps |
| ISO 100 | --- Approx. 0.3 fps |
| ISO 200 | --- Approx. 0.2 fps |
| ISO 400 | --- Approx. 0.2 fps |
| ISO 1600 | --- Approx. 0.05 fps |

[Reasons and remarks]
This is because the amount of time required for one photographic cycle increases by the data imprint time. (Same applies to previous cameras.)

2. With the Technical Back E, data/comment for the last frame cannot be revised.
   [Reasons and remarks]
   This is because auto rewind operation begins immediately after completing the last frame on the roll, eliminating the opportunity for data revision.
   * Service outlets can cancel the auto rewind function to make data revision possible for the last frame.

3. With the Technical Back E, LCD panel display does not operate when the back cover is open.
   [Reasons and remarks]
   This is because contacts with the body are interrupted and the back does not receive power from the body.

4. Data search/dump operation is not possible with the Technical Back E by itself.
   [Reasons and remarks]
   Reason is the same as above. The back must be installed on the body or the Keyboard Unit TB used for data seach/dump operation.
   * Data can be dumped from the Technical Back E by itself, but the unit's memory will not be cleared; Memory can be cleared by pressing the Technical back's clear button.

5. If the battery wears out and the camera stops while the Technical Back E is imprinting data during rewind, data will not be imprinted for the frame at which operation stopped.
   [Reasons and remarks]
   Inherent in the design specifications. When the battery is replaced, data imprinting resumes from the frame following that at which rewind stopped.

6. When using the Technical Back E with the 420EZ/300EZ and EOS 620/EOS 650, flash operation cannot be restored after operation of the SE function by pressing any of the switches on the camera or any of the buttons on the Technical Back E.
   [Reasons and remarks]
   Inherent in the design specifications.

7. Do not touch any of the camera controls while the camera is operating under control of the Technical Back's timer function.
   [Reasons and remarks]
   No damage will result, but timer operation may be reset or the camera settings may be made improperly.

[4] Precautions also applying to the T-series

■: This mark indicates items that must be covered in the instruction manual.

△: This mark indicates items that are in principle the same as the T50, T70, T80 and T90.

■ 1. When using the 577G or early Macrolite ML-1 (versions up to V-501) in the manual mode, manually set the X-sync shutter speed to 1/125 sec or slower.
[Reasons and remarks]
Although X-sync shutter speed is automatically set to 1/250 sec in the manual mode, uneven exposures will result because their flash duration is longer. (The bottom part of the frame will be underexposed.)

■ 2. Precautions concerning use of large, studio-type flashes
1) With the EOS 620, manually set X-sync shutter speed to 1/125 sesc or slower. (1/60 sec or slower with the EOS 650)
2) Use a Canon hot shoe adapter or PC socket adapter (special order with the T90) for connection to the camera.
[Reasons and remarks]
This is necessary because of the long flash duration of large studio-type flashes. Strictly speaking, test exposures should be made before using such flashes. Connection as mentioned above is necessary because the camera does not have a JIS-B type flash socket. The same applies when using cord connection with an ordinary flash.

■ 3. Film cartridge can be installed easier following these procedures.
△
1) "Swing" the cartridge into the camera from the bottom.
2) After inserting the cartridge, rotate the cartridge to where the film outlet is parallel with the surface of the film guide rails. (Same as the T70, T80 and T90)
[Reasons and remarks]
The cartridge is installed this way because the rewind fork always extends into the film chamber. Also, insertion will be difficult if the film outlet is parallel to the film guide rails before cartridge insertion because it will bump into the cartridge stabilizer guide at the top of the chamber.

■ 4. When loading the film, make sure film perforations are aligned with the sprocket teeth.
△
[Reasons and remarks]
The sprocket will not engage the film perforations and auto loading will not be performed properly if the perforations are not vertically aligned with the sprocket. If this occurs, the film transport bar marks flash on and off in warning.

■ 5. When using AE photography with self-timer or remote control, use the eyepiece cover. (The eyepiece cover is built into the shoulder strap pad.)
△
[Reasons and remarks]
To prevent underexposure due to light entering the camera through the eyepiece.

■△ 6. Camera damage will result if the flash contacts of a high voltage trigger type flash come into contact with the flash auto signal contact.
[Reasons and remarks]
For the same reason as the A and T series cameras and the New F-1. Recommend using specified Canon Speedlites.

■△ 7. When using aerosol-type cleaners such as "Dust-off", always hold the can at least 20cm (8 in) from the aperture.
[Reasons and remarks]
For the same reason as the T50, T70, T80 and T90.

■ 8. Linear-type polarizing filters cannot be used.
[Reasons and remarks]
The 45° main mirror in the body is a half mirror with polarizing characteristics, so incorrect AF operation will result if the camera is used with a linear-type polarizing filter.
[+]: Recommend using a Canon circular polarizing filter PL-C being introduced.

△ 9. A click sounds once each seccond during battery check
[Reason and remarks]
This results from operation of Mg-3, which is used as the load for battery checking.

△ 10. Auto load will not function properly and film edge perforations may tear during auto load if film has been exposed to humidity greater than 80% more than five minutes.
[Reasons and remarks]
Same as the T50, T70, T80 and T90. Moisture absorbed increases friction resistance.
* Film removed from its package in high humidity should be loaded quickly.

■△ 11. Thermal characteristics of LCD indicators
1) Response of external and viewfinder LCD devices is slower at temperatures below -20°C/-4°F, so indicators such as the film transport bar marks may appear sluggish.
2) At high temperatures:
External LCD
60°C/140°F --- Background will be tinted purple.
80°C/176°F --- Bachground will turn black and display will not be visible.
Viewfinder LCD
Black background lightens as temperature rises, and the entire indicator becomes transparent yellow-green when temperature approaches 80°C/176°F.
[Reasons and remarks]
Inherent in the characteristics of the element. Appearance returns to normal when temperature decreases.